FORMER DUSO CHEMICAL SITE AND ADJACENT MID-HUDSON BUSINESS PARK

DUTCHESS COUNTY

POUGHKEEPSIE, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 314103

Prepared for:

New York State Department of Environmental Conservation

Division of Environmental Remediation

625 Broadway

Albany, NY 12233

Prepared by:

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

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OCTOBER 2022

Site Management Plan Certification

I, Lindsay M. Mitchell, certify that I am currently a NYS registered professional engineer and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10).

Respectfully submitted,
AECOM USA, Inc.

STATE OF NEW YORK LINDSAY M. MITCHELL 088995 LICENSED PROFESSIONAL ENGINEER

Lindsay Mitchell

10/31/22

Lindsay M. Mitchell
Registered Professional Engineer
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Date

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Acronym	Definition
1,1,1-TCA	1,1,1-Trichloroethane
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
1,2-DCA	1,2-Dichloroethane
1,2-DCE	1,2-Dichloroethene
COC	Contaminant of Concern
CVOC	Chlorinated Volatile Organic Compounds
DER	Division of Environmental Remediation
DHB	Dehalobacter
DHC	Dehalococcoides
Duso Site	Former Duso Chemical Site
EC	Engineering Control
EISB	Enhanced *In Situ* Bioremediation
ELAP	Environmental Laboratory Accreditation Program
ERH	Electrical Resistance Heating
EVO	Emulsified Vegetable Oil
FS	Feasibility Study
ft bgs	feet below ground surface
GV	Guidance Value
HASP	Health and Safety Plan
IATA	International Air Transport Association
IC	Institutional Control
IDW	Investigation-Derived Waste
IR	Identify and Reduce
IRM	Interim Remedial Measure
ISTT	*In Situ* Thermal Treatment
LL	Low Level
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
MHBP	Mid-Hudson Business Park
MI	Mitigate
MIP	Membrane Interface Probe

Acronym	Definition
mL/m	milliliters per minute
MNA	Monitored Natural Attenuation
MO	Monitor
MS4	Municipal Separate Storm Sewer System
mV	millivolts
ND	Non-Detect
NFA	No Further Action
ng/L	nanograms per liter
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
ORP	Oxidation-Reduction Potential
PCE	Tetrachloroethene
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PID	Photoionization Detector
PRR	Periodic Review Report
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
Registry	Registry of Inactive Hazardous Waste Disposal Sites
ROD	Record of Decision
ROW	Right-of-Way
RSO	Remedial System Optimization
SCG	Standards, Criteria and Guidance
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOG	Soil Off Gas
SOP	Standard Operating Procedure
SRI	Supplemental Remedial Investigation
SSDS	Sub-Slab Depressurization System
SVI	Soil Vapor Intrusion
TCE	Trichloroethene
TOC	Total Organic Carbon

Acronym	Definition
µg/L	micrograms per liter
US EPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VCR	Vinyl Chloride Reductase
VOC	Volatile Organic Compound
ZVI	Zero Valent Iron

EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site (e.g., “Duso Site” and MHBP Treatment Area), as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan (SMP):

Site Identification: Site No. 314103, Former Duso Chemical New York State Superfund Site (“Duso Site”) and off-site Mid-Hudson Business Park (MHBP) Treatment Area, Fulton Street and North Road, Poughkeepsie, New York.

Institutional Controls:	1. The Duso Site and MHBP Treatment Area may only be used for commercial and industrial use.
	2. Institutional Controls Include: • Compliance with an approved SMP. • Protections for maintenance, industrial and construction workers and trespassers for surface soils (0 to 2 feet below ground surface); and construction workers working in subsurface soils. • Restrict the use of groundwater as a source of potable or process water. • Requirements that the property owner or designated representative complete and submit to NYSDEC an annual periodic certification of institutional and engineering controls via a Periodic Review Report. • Requirements that any new structures in the area of the previous groundwater contamination include sub-slab construction that allows for the installation and operation of vapor mitigation systems, or be constructed with vapor barriers incorporated into the slab. • All Engineering Controls must be operated and maintained as specified in this SMP and must be inspected at a frequency and in a manner defined in the SMP. • 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. • Provisions for the proper 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 Duso Site and MHBP Treatment Area within the Institutional Control (IC) boundaries 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/Deed Restriction. • Continued evaluation of the potential for vapor intrusion for any buildings developed in the area within the IC boundaries, including provisions for mitigation of any impacts identified.

Engineering Controls:	1. All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP.
	2. Groundwater Monitoring on the Duso Site and MHBP Treatment Area
	3. Duso Site Soil Vapor Intrusion (SVI) Sub-Slab Depressurization System (SSDS)
Inspections:	**Frequency**
1. Site-Wide Inspection (including all monitoring wells)	Annual beginning in 2022.
2. SSDS at the Duso Site	Periodically by property owner.
3. Occupancy of MHBP Building, including former Staples. If a change in ownership occurs, the current owner will need to be notified of the environmental conditions of the site and afforded the option to evaluate the potential for soil vapor intrusion into the building. Notification must also be made to the NYSDEC if the adjacent property is sold or ownership is transferred.	Annual assessments of occupancy of MHBP Building, including former Staples.
Monitoring:	**Frequency**
1. Site-Wide Groundwater Monitoring	Every five quarters
2. SVI Monitoring	Duso Site: Generally, air monitoring is not recommended if the SSDS hasbeen installed properly and is maintaining a vacuum beneath the building. Performance monitoring of the SSDS may be required in the Star Gas building in the case of unacceptable performance, preventative maintenance, repairs and/or adjustments made to the SSDS. MHBP Treatment Area: SVI sampling of the MHBP Building and/or former Staples to be offered when occupied.
Maintenance:	
1. Sub-Slab Depressurization System	Per the IRM Work Plan/Vapor Intrusion Manual (Section 5.0 and **Appendix G**)
Reporting:	**Frequency**
1. Site-Wide Groundwater Monitoring Reports for Remedial Action Effectiveness (Duso Site and MHBP Treatment Area).	Every five quarters, following completion of groundwater monitoring event
2. Periodic Review Report (Duso Site and MHBP Treatment Area)	Annually, or as otherwise determined by the Department

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

1. Introduction

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Former Duso Chemical New York State Superfund Site ("Duso Site") located in Poughkeepsie, New York which includes an off-site component consisting of the former Western Publishing property portion of the Mid-Hudson Business Park ("MHBP Treatment Area") and a former railroad right-of-way (ROW)/drainage swale, both of which are west of the Duso Site. A Site Location Map is provided as **Figure 1-1.** Through the remedial investigation process, these three properties have been determined to share a groundwater contaminant plume.

The Duso Site and MHBP Treatment Area are listed in the New York State Department of Environmental Conservation (NYSDEC) Environmental Site Remediation Database under separate numbers. Due to their close connection, they have both been addressed under the March 2008 Record of Decision (ROD) for the Duso Site, Site No. 314103, which is listed under the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites (i.e., State Superfund Program). The Duso Site is listed as Class 2, meaning the Site poses a significant threat to human health and/or the environment. The MHBP Treatment Area (Site No. 314099) is presently a Class N site, which is a Site that does not qualify to be placed on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites (Registry). Waste generated from the Former Duso Chemical Site and/or MHBP Treatment Area has had a history of disposal as hazardous waste during the remedial investigation/design phases due to the F001 and F002 waste classifications for TCE, PCE and 1,1,1-TCA associated with NYSDEC Site No. 314103. The MHBP Treatment Area property should continue to be designated as Class N because the source of contamination is from an off-site source (e.g., Duso Site) and active thermal treatment was completed on the property as of July 2017. **Figure 1-2** displays the site boundaries for the Duso Site, the MHBP Treatment Area and the former railroad ROW in accordance with available tax parcel information (**Appendix A**). Additional property details provided in **Appendix A** include parcel details for the Duso Site, MHBP Treatment Area property and former railroad ROW, as well as available survey mapping performed between 2011 and 2017. While several monitoring wells including BIW-1S/D, BIW-5S/D, MHC-23 and MHC-24 are technically located in the former railroad ROW based on the tax maps, for the purpose of this SMP, these areas are considered to be a part of the Duso Site.

The selected remedies for the Duso Site and the MHBP Treatment Area consist of Enhanced *In Situ* Bioremediation (EISB) and *In Situ* Thermal Treatment (Electrical Resistance Heating [ERH]), respectively, as detailed in the ROD and discussed in Section 2.5. Both remedies were implemented to address contaminant impacts in soil and groundwater. The EISB remedial action on the Duso Site was initiated in June 2013, with additional injections conducted in September through November 2013. The ERH remedial operation took place from December 2015 to July 2017 in the MHBP Treatment Area and was also conducted to address contaminant impacts in soils and groundwater.

After completion of the remedial work, some contamination remains at the Duso Site and MHBP Treatment Area, which is hereafter referred to as "remaining contamination". Institutional and/or Engineering Controls (ICs and ECs) have been incorporated into both site remedies to control exposure to remaining contamination to ensure protection of public health and the environment. A Deed Restriction granted to the NYSDEC, and recorded with the Dutchess County Clerk, requires compliance with this SMP and all ECs and ICs placed on both sites (**Appendix B**). Regular monitoring of groundwater conditions on both sites is important since the Duso Site is hydraulically upgradient of the MHBP Treatment Area and groundwater results provide an understanding of the interaction between both sites. Furthermore, a vapor mitigation system has been installed, is operating, and will be monitored on the Duso Site in the Star Gas facility.

This SMP was prepared to manage remaining contamination at the Site until the Deed Restriction is extinguished in accordance with 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 Deed Restriction 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 Deed Restriction. Failure to properly implement the SMP is a violation of the Deed Restriction, which is grounds for revocation of the Certificate of Completion; and
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the ROD (Site #314103) for the Site, and thereby subject to applicable penalties.

All reports associated with the Duso Site and MHBP Treatment Area 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 Duso Site and MHBP Treatment Area is provided in **Table 1-1** and **Table 1-2** (included in Section 1.3) of this SMP.

This SMP was prepared by AECOM USA, Inc. (AECOM) for the NYSDEC Division of Environmental Remediation (DER), in accordance with the requirements of the NYSDEC's 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 Deed Restriction for the Duso Site and MHBP Treatment Area.

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 occurrences: 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 Deed Restriction 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 applicable 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 6NYCRR Part 375 and/or Environmental Conservation Law.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP) (**Appendix C**). If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above mentioned 60-day advance notice is also required.
- 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.
- Notice within 48 hours of any non-routine maintenance activities.
- 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.

Responsibilities of the Owner and Remedial Party are listed in **Appendix D**. Any change in the ownership of the sites 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 March 2008 Record of Decision (ROD) issued by the NYSDEC and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of either the Duso Site or MHBP Treatment Area, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1-1 on the following page 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 **Table 1-2**.

Table 1-1. Notifications*

Name	Contact Information
Evelyn Hussey, NYSDEC Project Manager	518-402-6787; evelyn.hussey@dec.ny.gov
Michael Cruden, NYSDEC Bureau Director	518-402-9814; michael.cruden@dec.ny.gov
Sarah Saucier, NYSDEC Section Chief, Remedial Section C	518-402-9675; sarah.saucier@dec.ny.gov
Chief, Site Control Section	NYSDEC Division of Environmental Remediation 625 Broadway Albany, NY 12233-7020

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

Table 1-2. List of Site Contacts

Affiliation	Role	Name	Telephone	Email
NYSDEC	Project Manager	Evelyn Hussey	518-402-6787	evelyn.hussey@dec.ny.gov
NYSDEC	Section Chief	Sarah Saucier	518-402-9675	sarah.saucier@dec.ny.gov
NYSDOH	Project Manager	Mark Sergott	518-402-7860	mark.sergott@health.ny.gov

Affiliation	Role	Name	Telephone	Email
Star Gas Properties, Inc.	Property Owner – Former Duso Chemical Site	Rich Muellerleile	845-452-8400	rich@stargasproducts.com
Midhudson Center LLC/TFS Mid Hudson LLC	Property Owner – MHBP Treatment Area	Avrohom Schlaff	908-330-3677	Adschlaff@shlagro.com
County of Dutchess	Property Owner – Former Railroad ROW/Drainage Swale		845-486-2085	DPWAdmin@DutchessNY.gov

2. Summary of Previous Investigations and Remedial Actions

2.1 Site Location and Description

The Duso Site and MHBP Treatment Area are located in the Town of Poughkeepsie in Dutchess County, New York, approximately one-half mile east of the Hudson River on Fulton Street and North Road, respectively (**Figure 1-1**). The Duso Site is on Tax Parcel 134689-6162-05-042826 and the MHBP Treatment Area is on Tax Parcel 134689-6162-05-005836. The two properties comprise an approximately 6.5-acre area, with the MHBP Treatment Area consisting of approximately 2 acres and the Former Duso Chemical Site consisting of 0.7 acres. Additionally, the former railroad ROW/drainage swale that exists between the two properties is on Tax Parcel 134689-6162-05-011773, and is a small part of a large, upside-down "V"-shaped parcel near Route 9 in Poughkeepsie. The MHBP Treatment Area is in the southeastern portion of the MHBP property located at the corner of North Road (Route 9N) and Fulton Street. The Site location and approximate Site boundaries are provided on **Figure 1-1** and **Figure 1-2**, respectively.

The boundaries of the properties are described in **Appendix B** - Metes and Bounds and Deed Restriction/Environmental Easement. As discussed in Section 1, both the Former Duso Chemical Site and MHBP Treatment Area are in the State Superfund Program under Site No. 314103. At the time of issuance of this SMP, the Duso Site is owned by Rich Muellerleile of Star Gas Properties, Inc. and the MHBP Treatment Area is owned by Midhudson Center LLC/TFS Mid Hudson LLC. Additionally, the former railroad ROW/drainage swale in between the two properties is owned by the County of Dutchess.

2.2 Site History

A review of Sanborn records from 1950 through 1990 indicates that the previous property owner of the Duso Site prior to Star Gas was the Duso Chemical Company. The Duso Chemical Company operated a chemical warehouse and distribution business from 1950 through 1963. In 1972, the Duso property was bought by and is still currently occupied by Star Gas Products, Inc., a propane distribution facility. As a result of a fire at the warehouse in 1963 (Chazen, 1998) and historic site operations, releases of various volatile organic compounds (VOCs) occurred to the environment on both the Duso Site and off-site MHBP properties. Migration of contaminants from the Duso Site through the Conrail (now County of Dutchess) property, to the MHBP Treatment Area likely took place following a sudden discharge of chemicals during the fire and subsequent fire-fighting activities.

From 1910 to 1917, FIAT of Poughkeepsie manufactured approximately 2,000 automobiles at what is now the MHBP property. Western Publishing began production in a corner of the property in 1935. By the 1950s the plant grew to nearly 400,000 square feet. Operations at the facility included photography, lithography plate production, printing operations, coating, gluing and binding operations, and general plant operations and maintenance. The facility used inks, dyes and solvents, which were transported to the facility by truck and tanker. Large items like roll paper and some ink products were transported to the facility by rail. Types of chemicals used at the facility, as identified by a former employee, included acetone, benzene, carbon tetrachloride, isopropyl alcohol, kerosene, Salvasol #5, 1,1,1-trichloroethane (1,1,1-TCA) and trichloroethene (TCE). Some of these chemicals were reported to have been purchased from the Duso Chemical Company (Chazen, 1998).

2.3 Physical Setting

2.3.1 Land Use

The Duso Site is a 0.7-acre triangle shaped property. The Duso Site is relatively level, sloping gently to the west. A steep embankment borders the property to the east and a former railroad ROW and intermittent stream/swale border the property to the west. The Site is located within a mixed neighborhood of commercial establishments and residential properties. The Duso Site property is currently operated by Star Gas Products, Inc. (Star Gas), a propane distribution facility. Star Gas contains three buildings, a shed, and several aboveground propane storage tanks (**Figure 1-2**).

The MHBP Treatment Area is also located within a mixed neighborhood of commercial establishments, private properties, and residential buildings. There is a business park and shopping center to the west and north of the MHBP Treatment Area, and college dormitories are nearby as well. The MHBP Treatment Area consists of open unpaved and paved ground, and a building. The on-site building is currently vacant. The building immediately to the north was occupied by Staples (office products) until spring 2016. The topography of the MHBP Treatment Area and surrounding properties is relatively level. A narrow strip of property formerly owned by NY Central Lines, LLC is and now owned by the County of Dutchess is present between the Former Duso Site and the MHBP Treatment Area. This narrow property is the location of a former railroad ROW and intermittent stream/swale which borders the MHBP Treatment Area to the east. The swale directs flow off-site to a Municipal Separate Storm Sewer System and, eventually, the Hudson River. At the eastern property line, the ground surface rises rapidly to the east forming a low ridge.

2.3.2 Geology

The Duso Site and MHBP Treatment Area geology consists of three distinguishable unconsolidated soil deposits overlying bedrock. Based on the RI and supplemental investigation (O’Brien and Gere, 2007a), three unconsolidated deposits appear to be continuous across the Duso Site and MHBP Treatment Area. The uppermost deposit is a brown fine sand and silt which is described as ranging from 6 to 15 feet in thickness for both areas. A gray silt and clay deposit is encountered underlying the sand which is described in thickness ranging from 15 to 40 feet for the Duso Site and 35 to 60 feet for the MHBP Treatment Area. A coarse sand and gravel till deposit directly overlies the bedrock encountered beneath the MHBP Treatment Area, and is described in thickness ranging from 1 to 5 feet for both areas. The unconsolidated deposits form a wedge of soil that increases in thickness across the MHBP Treatment Area toward the south. Saturated soil on the Duso Site and MHBP Treatment Area has been identified in soil borings at depths ranging from approximately 3 to 6 feet below ground surface (ft bgs). Specifically, saturated soils on the Duso Site range from approximately 3 to 4 ft bgs and saturated soils in the MHBP Treatment Area range from approximately 4.5 to 6 ft bgs.

Bedrock underlying the Duso Site is encountered at depths ranging from approximately 25 ft to 40 ft bgs. The bedrock underlying the MHBP Treatment Area is encountered as shallow as 10 ft bgs near the northeast corner of the MHBP property, and as deep as 74 ft bgs near the southwestern portion of the Site. Two sets of geologic cross-sections prepared in 2007 and 2013 are provided in **Appendix E** (O’Brien and Gere, 2007a; AECOM, 2014). Site-specific boring logs can be located in the historical remedial investigation and design documents referenced in Section 8.

2.3.3 Hydrogeology

The Duso Site’s and MHBP Treatment Area's hydrogeological setting consists of two aquifers: the unconsolidated soil aquifer and the shallow bedrock aquifer. The unconsolidated soil aquifer exists in an unconfined state and responds to changes in seasonal weather conditions. Groundwater in the unconsolidated soil aquifer flows across the MHBP Treatment Area to the west and south with an apparent local influence from the intermittent stream. Groundwater flow in the unconsolidated soil aquifer on the Duso Site and further east generally mimics the topography and flows west until it is influenced by the intermittent stream and subsurface utilities located on the NY Central Lines, LLC property. The intermittent stream flows north to south along the abandoned railroad tracks of the NY Central Lines, LLC property, and is directed into a drain and drainage structures to flow below Fulton Street, and continues south.

The shallow bedrock aquifer, monitored by a small network of wells across the MHBP Treatment Area exhibits semi- confined conditions, which creates a diminished and delayed response to seasonal weather conditions. Groundwater in the shallow bedrock aquifer flows toward the regional discharge point, the Hudson River, southwest of the property. Monitoring has demonstrated that contaminants are limited to the unconsolidated soil aquifer due to the low permeability of deposits overlying the bedrock, and because of this condition, monitoring and reporting focuses on the unconsolidated soil aquifer.

Groundwater monitoring well construction logs and MIP investigation logs can be located in the historical remedial investigation and design documents referenced in Section 8. Shallow and deep groundwater contour maps are provided in **Appendix F**. Groundwater elevation data collected from 2018 to 2021 is provided in **Table 2-1**.

2.4 Investigation and Remedial History

This section includes a summary of the investigations and remedial activities performed for the Duso Site and the MHBP Treatment Area.

2.4.1 Historical Investigations 1994 to 2007

Several investigations of the MHBP property were performed in the mid-1990s, including a Phase I Environmental Site Assessment (Chazen, 1994a), a Phase II Preliminary Groundwater Investigation (Chazen, 1994b), a Remedial Investigation (Chazen, 1994c), and a Supplemental Remedial Investigation (Chazen, 1998). Elevated levels of chlorinated solvents were first detected in the soil and groundwater at the MHBP Treatment Area during the investigation in 1994 (Chazen, 1994a). Through these investigations NYSDEC identified the origin of the contamination to be the Duso Site.

The Supplemental Remedial Investigation (SRI) suggested that the contaminants at both the Duso Site and MHBP Treatment Area were from the Duso Chemical Company storage and distribution facility. The SRI, conducted from June 1995 to February 1998, encompassed the southeast corner of the MHBP Treatment Area, the Duso Site, and the NY Central Lines, LLC property, which separates the two areas. Groundwater, soil, surface water, and sediment samples were analyzed for VOCs. The SRI confirmed the absence of chlorinated VOC (CVOC) impacts in unsaturated soils in the MHBP Treatment Area. The SRI also determined that the overburden groundwater in the MHBP Treatment Area was impacted at high concentrations by 1,1,1-trichloroethane (1,1,1-TCA); 1,1-dichloroethane (1,1-DCA); 1,2-dichloroethane (1,2-DCA); 1,2-dichloroethene (1,2-DCE); and chloroethane. DNAPL free product was observed in one well in the MHBP Treatment Area coincidental to a topographic low point in the silt and clay unit in the southeastern portion of the area (well MHC-29) (O'Brien and Gere, 2007a). The majority of the groundwater impacts were observed to reside in the southeastern portion of the MHBP Treatment Area. The same contaminants were also observed in surface waters and sediments from the intermittent stream, between the two properties. In April of 1999, the NYSDEC listed the Duso Site as a Class 2 Site in the State's Registry of Inactive Hazardous Waste Disposal Sites.

A State Superfund Remedial Investigation (RI) was initiated for the Duso Site in 2005 and conducted in two phases in 2005 and 2007 at the Duso Site, on the adjacent NY Central Lines, LLC property, and the southeast portion of the MHBP Treatment Area (O'Brien and Gere, 2007a). This RI included installation of additional soil borings, monitoring wells (overburden and bedrock), and sampling of soil, groundwater and air samples. Soil samples were screened with a photoionization detector (PID) to assist in sample collection. VOCs were not observed in the unsaturated soils on the Duso Site or MHBP Treatment Area during the Phase I and Phase II investigations. Sample depths ranged from 0 to 20 ft bgs on the Duso Site and 6 to 24 ft bgs in the MHBP Treatment Area. The results of the soil boring samples confirmed impacts on the Duso Site and in the MHBP Treatment Area, and indicated the compounds of concern consisted of 1,1,1-TCA, 1,1-DCA, 1,2-DCA, tetrachloroethene (PCE), TCE and cis-1,2-DCE. Groundwater analysis confirmed previous results from wells on the Duso Site and MHBP Treatment Area with the same Contaminants of Concern (COCs) as identified in soils. DNAPL was not observed during groundwater monitoring.

An Interim Remedial Measure (IRM) was conducted at the Duso Site to address exposure pathways of vapor intrusion present from elevated soil vapor levels. A sub-slab depressurization system was installed on the Duso Site in February 2006 as PCE and TCE were detected in subsurface vapor and indoor air samples at that property above New York State Department of Health (NYSDOH) guidance for the protection of human health. Following installation, the concentrations of compounds of concern in indoor air were reduced to below their respective action levels (O'Brien & Gere, 2005, 2006). No exceedances were detected at that time in the MHBP Treatment Area in either the abandoned building or the commercial space that had been occupied by Staples at the time.

A Feasibility Study (FS) was then developed, which included the conceptual approach to the remediation of the Duso Site (O'Brien & Gere, 2007b). The FS evaluated a number of remedial options for both the Duso Site and the MHBP Treatment Area. The FS recommended EISB as the remedy for the Duso Site and *in situ* thermal treatment for the MHBP Treatment Area.

2.4.2 Supplemental Site Investigation (2011)

In 2011, AECOM conducted additional investigation activities at the MHBP Treatment Area and Duso Site. The additional activities included a Membrane Interface Probe® (MIP) subsurface investigation (March, July 2011) in the MHBP Treatment Area, installation of soil borings from six borings in the MHBP Treatment Area (SB-A to SB-F; August 2011) and installation of three stainless steel multi-level monitoring well clusters (X-PROP S/I/D, Y-PROP S/I/D and Z-PROP S/I/D) in the MHBP Treatment Area (August 2011), and collection of soil and groundwater for VOC analysis MHBP Treatment Area and Duso Site.

A MIP investigation was conducted in the MHBP Treatment Area utilizing available information to determine supplemental investigation locations. Continuous real-time field logging and monitoring for VOCs and other information was performed at 26 locations to identify zones of significant impacts. The MIP locations that indicated the highest VOC impacts vertically were generally located at depths between 10 and 25 ft bgs; however, some impacts extended to 45 ft bgs.

Based on the MIP results, six soil borings (SB-A to SB-F) were advanced using a Geoprobe® rig to collect samples for VOC analysis using a fixed laboratory to correlate to field results, as well as to better delineate the extent of impacts in the MHBP Treatment Area. The results confirmed existing information both in terms of compounds of concern, as well as locations and depths of impact.

To complete the 2011 supplemental delineation, a series of nine stainless steel monitoring wells (3 multi-level monitoring well clusters X-PROP S/I/D, Y-PROP S/I/D and Z-PROP S/I/D) were installed in the MHBP Treatment Area to provide additional monitoring locations for thermal treatment. The wells were installed in three depth-discrete borings crossing the proposed thermal treatment area and depth to allow a profile of the contaminant concentrations through the saturated soil column during remediation. Each well triplet had screened intervals at or near the bedrock interface, 15 to 20 ft bgs, and an intermediate depth between the two.

Groundwater sampling was conducted in February and March 2011 for monitoring well series MHBP, MHC and OBG and soils were sampled in August 2011 in borings SB-A to SB-F. Groundwater and soil sampling results from 2011 are provided in **Table 2-2** and **Table 2-3**, respectively. MIP soil conductivity, soil boring logs and well construction logs can be found in the remedial investigation and design documents referenced in Section 8. Pertinent sampling locations are provided on **Figure 1-2**.

2.4.3 Supplemental Site Investigation (2012)

The 2012 Supplemental Investigation was conducted in order to support design and planning to implement the selected remedy (EISB) for the Duso Site, including delineating the extents requiring treatment for CVOCs, quantification of current dechlorinating bacteria, and evaluation of nutrients and competing electron acceptors for biotic reductive dechlorination reactions. The Supplemental Investigation was also conducted in the MHBP Treatment Area to assist delineation of the thermal remediation treatment zone.

In August 2012, 12 additional 2" PVC monitoring wells were installed at the Duso Site, including five multi-level pairs (BIW-1S/D, BIW-2S/D, BIW-3S/D, BIW-5S/D, and BIW-6S/D) and two singlet wells (BIW-4 and

BIW-7), as shown on **Figure 1-2**. In November 2012, the new monitoring wells were developed and sampled using low-flow methods and groundwater samples were also collected from wells MHC-23, MHC-25S, and MHC-26, which are also on the Duso Site.

In December 2012 a supplemental delineation was performed in the MHBP Treatment Area. Additional multi-level monitoring wells (TW-1S/ID to TW-7S/I/D; November 2012) were installed to assist delineation of the thermal remediation treatment zone. Following installation of these new wells, low-flow groundwater sampling was performed in December 2012 for MHBP Treatment Area monitoring wells to provide a comprehensive baseline horizontal and vertical delineation of VOCs in groundwater prior to thermal remediation. Results of the groundwater sampling added further horizontal and vertical delineation to the impacted area to allow a treatment zone to be defined.

Field screening results also indicated that groundwater from these wells exhibited conductivity measurements that ranged between 0.5 and 3.0 mS/cm. The overburden and bedrock wells installed in 2011 and 2012 bounded the plume to the north, west and south. Groundwater contamination appears to be contained within the unconsolidated soil aquifer, and results from the wells open to the bedrock aquifer continue to support this conclusion.

Groundwater laboratory results from 2012 are presented in **Table 2-2** (MHBP Treatment Area only) and **Table 2-4** (Duso Site only). Soil laboratory results from 2012 are presented in **Table 2-3** for the MHBP Treatment Area and on the cross-sections dated March 2013 in **Appendix E** for both the Duso Site and MHBP Treatment Area. Soil boring logs and well construction logs are provided in the applicable remedial investigation and design documents referenced in Section 8.

2.5 Remedial Action Objectives and Implementation of the Selected Remedy

2.5.1 Remedial Action Objectives

As defined in the ROD (NYSDEC, 2008) the overarching remediation goals for the Duso Site and off-site MHBP Treatment Area are to eliminate or reduce to the extent practicable:

1. Exposures of persons at or around the sites to VOCs in soil and groundwater;
2. The release of contaminants from the saturated soil into groundwater that may create exceedances of groundwater quality standards; and
3. The release of contaminants from groundwater into indoor air through soil vapor intrusion.

Furthermore, the specific remediation criteria for the Duso Site and MHBP Treatment Area include attaining to the extent practicable:

4. Protection of Groundwater Soil Criteria for soils within the Duso Site and MHBP Treatment Area (6 NYCRR, Part 375-6, Remediation Program Soil Cleanup Objectives – SCO); and
5. Ambient Water Quality Standards (Class GA) for the groundwater within the Duso Site and MHBP Treatment Area.
6. Air guidelines provided in the *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006; updated September 2013, August 2015 and May 2017).

Table 2-5 reports the contaminants of concern as determined by the ROD for soil and groundwater along with their respective cleanup standards. Chlorinated volatile organic compounds (CVOCs) are the primary COCs, including 1,1,1-TCA, 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), chloroethane, PCE, TCE, cis-1,2-DCE and vinyl chloride.

Table 2-5. Treatment Criteria

Compounds of Concern	Groundwater Standard[1] (µg/L)	Soil Criteria (Groundwater Protection[2] milligram per kilogram [mg/kg])
1,1,1-Trichloroethane	5	0.68
1,1-Dichloroethane	5	0.27
1,1-Dichloroethene	5	0.33
1,2-Dichloroethane	0.6	0.02
2-Butanone (Methyl ethyl ketone)	50 Guidance Values (GV)	0.12
4-Methyl-2-pentanone	Not Applicable (NA)	NA
Acetone	50 (GV)	0.05
Benzene	1	0.06
Chloroethane	5	NA
Chloromethane	5	NA
cis-1,2-Dichloroethene	5	0.25
Methyl tert-butyl ether	10(GV)	0.93
Methylene chloride	5	0.05
Tetrachloroethene	5	1.3
Trichloroethene	5	0.47
Vinyl chloride	2	0.02

[1] Standards, Criteria, and Guidance Values (SCG), Class GA Ambient Water Quality Standards, per 6 NYCRR Part 375

[2] Soil Cleanup Objectives, per 6 NYCRR Part 375

NA - Not applicable

Table 2-6 reports the contaminants of concern as determined by the ROD for sub-slab soil vapor and indoor air along with their respective air guidelines. Refer to Section 2.5.2.3 for a description of the sub-slab depressurization system (SSDS) on the Duso Site.

Table 2-6: Sub-Slab Vapor and Indoor Air Contaminants of Concern and NYSDOH Air Guidelines

Contaminants of Concern	NYSDOH Ambient Air Guidelines (µg/m3)[1]	NYSDOH Decision Matrix[4]
Carbon Tetrachloride	Not available	Matrix A
1,1-Dichloroethene	Not available	Matrix A
cis-1,2-Dichloroethene	Not available	Matrix A
Tetrachloroethene	30[3]	Matrix B
1,1,1-Trichloroethane	Not available	Matrix B
Trichloroethene	2[2]	Matrix A
Vinyl Chloride	Not available	Matrix C

[1] NYSDOH (2006)

[2] Revised as of August 2015

[3] Revised as of September 2013

[4] Revised as of May 2017

The primary guidance document governing soil vapor work in New York is the G*uidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006; updated in September 2013, August 2015 and May 2017). Decision matrices have been developed as part of this guidance by the NYSDOH as risk management tools that provide specified actions based on the concentrations of individual compounds in the indoor air and sub-slab soil vapor. Due to the May 2017 update, the number of decision matrices has changed from two (i.e., Matrix 1 and 2) to three (i.e., Matrix A, B and C). See **Tables 2-7, 2-8 and 2-9** for a presentation of Matrices A, B and C, respectively. The Duso Site soil vapor contaminants are assigned one of the decision matrices based on the guidance. Four actions are possible from these matrices: no further action (NFA), identify and reduce (IR) sources within the structure, monitor (MO) indoor air and sub-slab soil vapor, and mitigate (MI).

Table 2-7. NYSDOH Decision Matrix A

	Indoor Air (µg/m3)		
Sub-Slab Vapor (µg/m3)	<0.2	0.2 to <1	1.0 and above
<6	NFA	NFA	IR/MI
6 to <60	NFA	MO	MI
60 and above	MI	MI	MI

NFA – No Further Action

IR – Identify Source and Resample

MO – Monitor Only

MI – Mitigate

Table 2-8. NYSDOH Decision Matrix B

	Indoor Air (µg/m3)		
Sub-Slab Vapor (µg/m3)	<3	3 to <10	10 and above
<100	NFA	NFA	IR
100 to <1,000	NFA	MO	MI
1,000 and above	MI	MI	MI

Table 2-9. NYSDOH Decision Matrix C

	Indoor Air (µg/m3)	
Sub-Slab Vapor (µg/m3)	<0.2	0.2 and above
<6	NFA	IR
6 to <60	MO	MI
60 and above	MI	MI

2.5.2 Remedial Actions

Based on the Administrative Record in the ROD, the NYSDEC selected EISB as the remedy for the Duso Site and *in situ* thermal treatment as the remedy for the MHBP property. Summaries regarding the remedial actions are provided in Sections 2.5.2 and 2.5.3.

2.5.2.1 Duso Site EISB Remedial Action

In June 2013, the EISB remedial action was initiated on the Duso Site to address chemical contaminant impacts in soils and groundwater. EISB via reductive dechlorination is a remediation technology applied for treating CVOCs in groundwater. Through the process of biologically-mediated reductive dechlorination, CVOCs are transformed through a series of sequential biochemical reactions where chloride atoms are replaced by hydrogen atoms by naturally occurring bacteria under reducing conditions to eventually form non-toxic ethene and less toxic chloroethane. These biologically-mediated reactions occur favorably in anaerobic (negligible dissolved oxygen), reducing (oxidation-reduction potential [ORP] is less than -50 millivolts [mV]), circumneutral (pH between 6.0 and 8.5) groundwater. Limited reductive dechlorination was occurring historically, but generally conditions were not ideal for reductive biodegradation.

Enhanced bioremediation modifies groundwater geochemistry to create reducing conditions that are conducive to the progressive dechlorination of CVOCs by bacteria through the addition of a carbon substrate, which serves as a source of an electron donor (hydrogen) and a microbial energy source. Anaerobic microbial dechlorination of chloroethane is not a significant pathway that has been observed in bench- or field-scale studies. However, chloroethane, as well as 1,1,1-TCA, has been observed to be biodegraded by aerobic methane-oxidizing bacteria. Methane generated as a result of adding the carbon substrate may support natural attenuation of the chloroethane as groundwater returns to baseline conditions within the treatment area.

The primary electron donor for the EISB Pilot Study was an emulsified vegetable oil (EVO) (i.e., SRS®-SD manufactured by TerraSystems). A reductive amendment, EHC®, was also applied to areas of the pilot study with the highest concentrations of CVOCs (i.e., greater than 100,000 micrograms per liter [µg/L]). EHC® is a controlled-release organic carbon of fibrous organic material that also contains zero valent iron (ZVI). EVO and EHC® injection locations are provided on **Figure 2-1.** Injection batches were prepared by adding appropriate quantities of water to achieve the selected dilution concentration. All electron donors or carbon substrates were injected at pre-determined volumes into the subsurface using direct-push tooling. Temporary injection points were advanced using direct-push drill rigs, where a bottom-up injection approach was utilized.

In June 2013, September and October 2013, injections of EVO were conducted. In November 2013, injections of EVO and EHC® were performed. Subsequent to the June 2013 injections, five shallow soil borings (0 to 4 ft bgs) were advanced on June 19, 2013 with the objective of determining if high concentrations of residual CVOCs were present that could provide a long-term source of contamination and re-contaminate areas that will be treated by EISB. Subsequent to the completion of all injection events, remediation performance monitoring was initiated in November 2013 and continued in accordance with the performance monitoring schedule thereafter. The performance monitoring was designed to assess contaminant concentrations and transformation, the distribution of the ZVI and carbon substrate in the subsurface (using total organic carbon [TOC] analysis as well as field geochemical parameters), and groundwater geochemistry.

Refer to the Enhanced *In-Situ* Bioremediation Pilot Study Summary Report (AECOM, 2022a) for additional design, injection and monitoring details.

2.5.2.2 MHBP Treatment Area *In Situ* Thermal Treatment Remedial Action

The remedy selected by the NYSDEC to address soil and groundwater contamination for the off-site MHBP Treatment Area was described in the Work Plan for ERH (CES, 2015) and the Final DAR (AECOM, 2014). *In Situ* Thermal Treatment (ISTT) via ERH was implemented to remove and treat CVOC impacts in soil and groundwater present in the MHBP Treatment Area. See **Figure 1-2** for the treatment area location.

The ERH technology couples electrical power to the subsurface through an array of transformer-isolated subsurface electrodes. The electrical energy resistively heats soil and groundwater above ambient temperatures to those necessary for contaminant volatilization and recovery. Stacked (segmented) electrodes are used because they provide an option to adjust energy input over depth and result in a focused heating pattern. ERH generates steam within the soil pores throughout the interior heated zone and this ensures contact between steam and contaminant. The soil off gas (SOG) piping manifold system, which is connected to the electrode vents and cap vents, and an asphalt cap were in place to collect contaminant vapor and steam, which is then processed through a multi-phase separation and treatment system. Thermal degradation of certain CVOCS (1,1,1-TCA) via hydrolysis is the primary mechanism of removal and vapor/steam generation also resulted in remaining CVOC removal.

Refer to the Final Engineering Report (FER) (AECOM, 2022b) for more details regarding the ERH design and implementation.

2.5.2.3 Sub-Slab Depressurization System Remedy for SVI Mitigation

Soil vapor intrusion refers to the process by which VOCs migrate from the subsurface into the indoor air of buildings. Soil vapor is the air found in the pore spaces between soil particles. Primarily because of a difference between interior and exterior pressures, soil vapor can enter a building through cracks or perforations in slabs and through openings around sump pumps or where pipes and electrical wires go through the foundation. Due to vapor intrusion of CVOCs, a SSDS was installed within the Star Gas building on the Duso Site in 2006. In addition, an SSDS was installed in the MHBP Treatment Area to the north of the electrode field in conjunction with the thermal treatment implementation. See below for additional details for each site.

<u>Duso Site</u>

An SSDS was installed at the Duso Site in the Star Gas Building in February 2006 as PCE and TCE were detected in subsurface vapor and indoor air samples at that property above NYSDOH guidance for the protection of human health. The SSDS was installed as a permanent, integral addition to the building and creates a negative pressure field directly under the slab and around the foundation of the building. During the SSDS installation, the floor cracks were sealed and a one cubic foot hole was created under the slab where a PVC pipe was installed and sealed to the hole. The vapor extraction piping extended through the floor up through the ceiling and connected to a low vacuum centrifugal fan blower located on the northern exterior of the building. The blower was installed to withdraw the air from below the building slab and direct it to the atmosphere outside the building via a discharge pipe that extends at least 1-foot above the building roof line. Following installation, the concentrations of compounds of concern in indoor air were reduced to below their respective action levels (O’Brien & Gere, 2005, 2006). Refer to **Figure 2-2** for an as-built drawing of the SSDS that was installed on the Duso Site within the Star Gas Office Building.

<u>MHBP Area</u>

An SSDS was installed between the former Western Union Publishing space and former Staples space in a large room called the “Unoccupied Space” along the northern wall to control any potential vapor migration due to the thermal treatment system. The SSDS was designed and installed similar to a radon removal system. A collection pit was made below the concrete floor at four locations. A screened vapor recovery well was installed in each pit and connected to PVC piping that extended to the vacuum blower located on the outer wall at the top of the building. The blower withdrew the air from the sub-slab zone and directed it to vapor treatment via an activated carbon drum. The sub-slab air was then released to the atmosphere outside of the building via a discharge vent which extended three feet above the building roofline. Refer to **Figure 2-3** for the SSDS Layout and location within the MHBP Treatment Area, and **Figure 2-4** for the SSDS as-built details. Performance monitoring of the SSDS was conducted in January 2017 and indicated that the system was constructed in general accordance with the original contract specifications to function as it was intended. A sample obtained post-carbon indicated ambient air exceedances. The activated carbon drum was changed out shortly thereafter.

The SSDS located just south of the former Staples space was decommissioned during the removal and restoration of the ERH Treatment System in September 2017.

2.6 Remaining Contamination

The sections below describe the remaining soil and groundwater contamination at the Duso Site and the MHBP Treatment Area.

2.6.1 Duso Site

The following section summarizes the results of the groundwater measurements and analytical results of the groundwater samples collected during the post-EISB phase of the pilot study (November 2013 through October 2016). In addition, a summary of soil samples collected from the shallow soil borings on June 19, 2013 is included as these are the latest soil samples collected on the Duso Site and indicate remaining impacts in the unsaturated zone. Groundwater sample results were compared to NYSDEC Ambient Water Quality Standards (AWQS) and guidance values (GV), when applicable. The soil samples were compared to the 6 NYCRR Part 375 Soil Cleanup Objectives (SCOs) for Protection of Groundwater and Protection of Public Health – Commercial Use. Note that the SCOs for the Protection of Groundwater are equivalent to the SCOs for Unrestricted Use. As specified in Section 2.4.1 of this report, the 2006 IRM installed an SSDS and following installation, the concentrations of COCs in indoor air were reduced to below their respective action levels and the system remains active as of the date of this document. Therefore, remaining contamination of soil vapor or indoor air are not discussed.

2.6.1.1 Soil

Soil samples on the Duso Site within the unsaturated and saturated zones were collected during the 2005 and 2007 RI Investigations, as discussed in Section 2.4.1, and in June 2013 during the initial round of EISB injections. During the RI investigation in 2005 and 2007, soil samples were collected from 0–9 feet from the “SS” and “GP” borings, and VOCs were not detected in the soils in the unsaturated zone. However, when the site-wide “BIW” wells were installed in 2012, there were some significantly elevated PID readings in shallow soils for some of the borings (BIW-2S/D, BIW-3S/D, BIW-6S/D). Therefore, five additional soil samples were collected in June 2013 to evaluate if the elevated PID readings coincided with high CVOC impacts which could potentially provide a long-term source of contamination and re-contaminate areas that would be treated by EISB. As summarized below, the June 2013 soil sampling indicated that concentrations of several COCs were elevated in the soil samples collected from 0-4 feet bgs in each boring, and that based on their concentrations, the soils may be a continual source of CVOCs to groundwater in the unsaturated zone. The need for collection of soil samples at the Former Duso Chemical Site for analysis of CVOCs will be evaluated following collection and review of groundwater sample results.

VOCs were detected in all five soil samples collected from the shallow soil borings advanced on June 19, 2013; however, none of the compounds detected were reported at concentrations greater than the SCOs for Protection of Public Health – Commercial Use. Refer to **Figure 2-1** for the soil boring locations and data results for 1,1,1-TCA, 1,1-DCA, PCE and TCE on the Duso Site. **Table 2-10a** includes all of the VOC analytical results for these five samples. The primary COCs detected most often include PCE, TCE, and cis-1,2-DCE. The highest detected concentrations of PCE were present in SB-2 (1-2’) and SB-3 (1-2’), with concentrations reported to be 11 mg/kg and 28 mg/kg, respectively. The highest detected concentrations of TCE were present in SB-1 (3-4’) and SB-5 (1-2’), with concentrations reported to be 11 mg/kg and 85 mg/kg, respectively. Additionally, cis-1,2-DCE was detected in SB-4 (2-3’) at 94 mg/kg. Although none of the compounds detected in the shallow soil borings were reported at concentrations greater than the SCOs for Protection of Public Health – Commercial Use, several of the compounds were reported at concentrations greater than the SCOs for Protection of Groundwater. This indicates that there may be a continual source of these CVOCs to groundwater in the unsaturated zone.

The primary VOCs that were detected above SCOs for the Protection of Groundwater (same values as Unrestricted SCOs) include PCE (SB-1 to SB-5); TCE (SB-1 to SB-5); and cis-1,2-DCE (SB-1 to SB-5). Other VOCs that were detected above SCOs for the Protection of Groundwater include 1,1-DCA (SB-1); 1,2-Dichlorobenzene (SB-4, SB-5); 1,2-DCA (SB-1, SB-4, SB-5); 1,4-Dichlorobenzene (SB-4, SB-5); 2-butanone (SB-2, SB-4); acetone (SB-2, SB-4); benzene (SB-1, SB-4, SB-5); chlorobenzene (SB-4); chloroform (SB-1, SB-5); ethylbenzene (SB-5); methylene chloride (SB-4, SB-5); toluene (SB-5); trans,1-2-DCE (SB-4); vinyl chloride (SB-1, SB-4, SB-5); and total xylene (SB-5).

Table 2-10b summarizes the results of all soil samples collected that exceed the Protection of Groundwater and Public Health – Commercial Use SCOs at the Duso Site.

2.6.1.2 Groundwater

The post-EISB injection performance monitoring program included twelve groundwater sampling events from November 2013 to November 2021. Each monitoring event included measuring depth-to-groundwater, collecting groundwater samples for laboratory analysis, and measuring and recording field water quality parameters (pH, temperature, DO, ORP, turbidity, and conductivity) from 10 designated on-site wells. During the December 2014, October 2015, and October 2016 groundwater sampling events, an additional six wells were included in the scope of work. Refer to **Table 2-4** for the full set of groundwater analytical and field data for the Duso Site from 2011/2012 (baseline) to November 2021.

In post-EISB samples, depth-to-groundwater generally ranged from near the ground surface to 5 feet bgs, which is generally consistent with groundwater observations prior to injection. The November 2021 contour maps presented in **Appendix F** indicate groundwater generally flows to the south-southwest.

As of the completion of the EISB monitoring program in October 2016, the results of the post-injection performance monitoring indicate that there is evidence of reductive dechlorination conditions and biodegradation within the groundwater at the Duso Site. The concentrations of parent solvents (1,1,1-TCA, PCE, TCE, and 1,1-DCA) have been observed to decrease in most monitoring wells within the pilot study area, with temporary increases in sequential dechlorination daughter products (chloroethane, cis-1,2-DCE, vinyl chloride, and ethene) observed throughout the area. Furthermore, complete reductive dechlorination is also evident at the Duso Site with concentrations of some daughter products reported to be less than pre-injection concentrations at several wells.

Reductive dechlorination conditions and biodegradation is also evident in the reduction of total CVOCs. From November 2012 to October 2016, Total VOCs decreased in 12 wells (BIW-1D, BIW-2S, BIW-3S, BIW-3D, BIW-4, BIW-5D, BIW-6D, MHC-22, MHC-23, MHC-24, MHC-25S, and MHC-26).

The majority of the remaining mass exists in the hydraulically downgradient, western edge of the treatment area in proximity to monitoring wells BIW-1S, BIW-5S/D, MHC-23, and MHC-26. Although degradation byproducts have been observed in each of these wells in addition to thriving microbial populations, persistent and sometimes increasing molar concentrations of CVOCs have been observed. More specifically, molar concentrations of 1,1,1-TCA and degradation by-products have trended upward in the shallow zones and trended downward in the deeper zones. Additionally, molar concentrations of PCE degradation by-products have followed the same trend. Refer to **Table 2-11** for a presentation of: 1) the molar increases and decreases of chlorinated ethenes and chlorinated ethanes, and 2) the percent reduction of total CVOC concentrations up to October 2016.

Despite the upward trend of CVOCs in the wells previously mentioned, dechlorination and biodegradation is still occurring, and the environment required for this to continue to occur is strong. Furthermore, the treatment zone hydraulically upgradient, in the vicinity of monitoring wells BIW-6S/D, BIW-2S/D, and MHC-22, still show evidence of an anaerobic reducing environment consisting of elevated methane levels, pH between 6 and 7, ORP < -100 mV, and sufficient TOC concentrations. This upgradient environment will serve as a reductive front capable of providing longer lasting treatment to the downgradient treatment zones. The treatment area inclusive of this upgradient front has low levels of CVOCs that have nearly been treated. This will reduce the amount of TOC consumption that would have normally been observed if the contaminant mass was much higher.

Figure 2-5 summarizes the total CVOC results of all groundwater samples that exceeded the SCGs following completion of the EISB pilot study action on the Duso Site, through November 2021. It should be noted that active heating beneath the adjacent MHBP Treatment Area was occurring simultaneously with the October 2016 groundwater monitoring event at the Duso site, which seems to have affected the concentrations of CVOCs in soil and groundwater in the western portion of the Duso site nearest the thermal remediation activities. Select wells demonstrated an increase in chloroethanes at that time. Additional data was collected in 2018, 2019, and 2021 as part of site management activities in order to determine the overall effect of the subsurface heating on CVOC and microbial population concentrations in groundwater on the Duso Site. **Figures 2-8** and **2-9** contain the most recent individual site-related VOC results collected since 2018 across all properties from the shallow/intermediate and deep monitoring wells, respectively.

A round of low-flow sampling for VOCs, monitored natural attenuation parameters, microbes and field parameters was performed during the November 2021 event (**Table 2-4**), With the exception of MHC-23, BIW-1D, and BIW-5D, all of the wells that were sampled contained generally lower or similar CVOC concentrations than those reported during the previous groundwater monitoring event performed in June 2019. Based on available data, the concentrations of microbial populations beneath the Duso Site declined significantly between October 2016 and November 2021. **Table 2-4** contains the post-EISB groundwater monitoring data through November 2021.

The most recent groundwater sampling event was conducted on the property during a field mobilization in November 2021. Low-flow groundwater sampling for emerging contaminants (Per- and Polyfluoroalkyl Substance [PFAS] compounds and 1,4-Dioxane) was performed (refer to **Table 2-13**). AECOM collected five sets of emerging contaminants samples (PFAS and 1,4-dioxane) from the Duso Site, as well as ten sets of samples from the MHBP Treatment Area, along with quality assurance/quality control samples, for the purpose of site-wide screening. Analytical results indicate that BIW-1S, BIW-1D, BIW-2S, BIW-5S, BIW-5D, MHC-23, MHC-25S, and MHC-26 contained concentrations of 1,4-dioxane above the proposed New York State Ambient Water Quality Guidance Value (AWQ GV) of 0.35 μg/L, with results of 1.7 μg/L, 1.2 μg/L, 1.6 μg/L, 1.7 μg/L, and 3.3 μg/L, respectively). Six of the wells sampled on the Duso Site (BIW-1S, BIW-2S, BIW-5S, MHC-23, MHC-25S, and MHC-26) contained concentrations of Perfluorooctanoic acid (PFOA) and/or Perfluorooctanesulfonic acid (PFOS) above the NYS AWQ GV of 6.7 nanograms per liter (ng/L) and 2.7 ng/L, respectively. **Figures 2-10** and **2-11** contain emerging contaminant sampling results since 2018 across all properties from the shallow/intermediate and deep monitoring wells, respectively.

2.6.2 MHBP Treatment Area

The assessment to determine the amount of remaining contamination in the subsurface of the MHBP Treatment Area following completion of thermal treatment activities involved evaluating soil and groundwater COC concentrations and total CVOC mass. Based on historical investigations, CVOCs are the primary COCs in the MHBP Treatment Area including 1,1,1-TCA (the primary COC), 1,1-DCA, 1,2-DCA, 1,1-DCE, chloroethane and vinyl chloride.

As discussed in Section 2.5.2.3 of this document, the objective of installation of the SSDS in the MHBP Treatment Area was to mitigate potential soil vapor intrusion during the ERH treatment activities. In 2017, the SSDS in the “Unoccupied Space” was decommissioned during the removal of the ERH Treatment System and site restoration.

2.6.2.1 Soil

Soil analytical data for VOCs were collected historically (1998 to 2012), mid-treatment (December 2016) and end of treatment (April 2017). Soil sample locations were placed based on historical boring locations with elevated data, current infrastructure, and to provide coverage of the thermal treatment area. The data was tabulated and compared to NYSDEC Part 375 SCOs for Protection of Groundwater. **Table 2-3** includes the full analytical results of the soil VOC sample analysis in the MHBP Treatment Area, and **Table 2-12** includes a summary of the 2016 and 2017 soil data exceedances. Refer to **Figure 2-6** for CVOC soil results for December 2016 to January 2017 and April to May 2017.

<u>Remaining COC Soil Impacts across the MHBP Treatment Area from 2 to 10 ft bgs</u>

Soils were collected in December 2016 and April 2017 with the bulk of samples collected from the 6 to 10 ft interval, except for two samples obtained from the 2 to 5 ft bgs interval (SB-9 and SB-7). As minimal data was collected from 0 to 4 feet bgs during the 2016 and 2017 sampling events, it is important to note that 21 historical samples (2007) were collected and analyzed for VOCs within the 0 to 4 ft bgs interval (4 samples from 0 to 2 ft bgs in 2007 and 17 samples from 2 to 4 ft bgs in 1998). Those historical results indicated that from 0 to 2 ft bgs, all VOC concentrations were non-detect (ND) and from 2 to 4 ft bgs, 1,1,1-TCA was very low, ranging from ND to 0.004 J mg/kg and all remaining VOC results were ND.

For the 2016 and 2017 sampling events, concentrations of 1,1,1-TCA across the treatment area from soils collected at 2 to 10 ft bgs ranged from ND to 9.2 mg/kg (ISB-02). The concentrations exceeding criteria are present in the northeast (ISB-02 at 6 to 7 ft bgs) and eastern border (ISB-05 at 6 to 7 ft bgs, PR-SB6 at 8.5 to 10 ft bgs, PR-SB7 at 2 to 5 ft and PR-SB9 at 3.5 to 5 ft bgs) of the treatment area. Concentrations of 1,1-DCA, 1,1-DCE, 1,2-DCA and vinyl chloride from December 2016/April 2017 across the treatment area from 2 to 10 ft bgs ranged from ND to 14 mg/kg (1,1-DCA in PR-SB6). The concentrations exceeding criteria are present in the northeast (ISB-02 at 6-7 ft bgs), east border (PR-SB6 at 8.5-10 ft bgs, PR-SB7 2-5 ft, ISB-03 7-8 ft bgs) and central east (PR-SB2 6.5-8 ft bgs) of the treatment area. December 2016/April 2017 soil criteria exceedances of non-primary COCs only included acetone in April 2017 samples (SB-7 along east border and SB-10 in Area C in the central location).

Remaining COC Soil Impacts across the MHBP Treatment Area from 10 ft to 25 ft bgs

Concentrations of 1,1,1-TCA across the MHBP treatment Area from the depth interval of 10-25 ft bgs were generally observed to decrease over time to non-detectable levels. Historical concentrations ranged from 34 mg/kg (2005) to 1,000 mg/kg (2011). Soil sample results obtained from the northeast and center of the treatment area were reduced to below their respective criteria (PR-SB6 only) or to non-detectable levels. Concentrations of 1,1,1-TCA in the southern portion of Area A are all non-detect based on the April 2017 soil sampling event.

The April 2017 concentrations of 1,2-DCA, 1,1-DCE, vinyl chloride (VC) and TCE were generally low/non-detectable and below their respective regulatory criteria in Areas A, B and C. An exception to this is vinyl chloride, which was detected at 0.025 mg/kg in soil boring PR-SB4 (13-15 ft bgs), which is above criteria in Area B in the central portion of the treatment area. December 2016/April 2017 soil criteria exceedances of other non-primary COCs included acetone in many soil borings and 2-butanone in PR-SB4 in April 2017 and ISB-08 in December 2016.

Remaining COC Soil Impacts across the MHBP Treatment Area from 26 ft to 65 ft bgs

For soils sampled at depths ranging from 26 ft to 65 ft bgs, all December 2016 and April 2017 CVOC concentrations, including 1,1,1-TCA, were generally detected at low or non-detectable concentrations and below their respective soil criteria in Areas A, B and C. Soil samples were obtained from 27 ft, 37 ft, 40 ft,50 ft, 60 ft and 65 ft depths across the treatment area. The exception is that soil sample ISB-05 (50 ft bgs) located in Area A along the east border of the treatment area had detections of VC and 1,2-DCAabove criteria in December 2016. No April 2017 data is available at this depth.

Regarding other non-primary COCs, no December 2016/April 2017 soil samples exceeded criteria.

Table 2-12 and **Figure 2-6** summarize the results of all soil samples that exceed the SCGs after completion of the remedial action.

2.6.2.2 Groundwater

Groundwater VOC concentrations were monitored and evaluated throughout ERH treatment activities. The data was tabulated and compared to NYCRR Part 703.5 Groundwater Standards. **Table 2-2** includes the full analytical results of groundwater VOC sample analysis in the MHBP Treatment Area through November 2021. Refer to **Figure 2-7** for CVOC groundwater analytical results from the MHBP Area between January 2016 and January 2018.

The most recent groundwater sampling event was conducted on the property in November 2021. Low-flow groundwater sampling was performed for emerging contaminants (refer to **Table 2-13**) and VOCs, monitored natural attenuation parameters, microbes and field parameters . VOC sampling results through November 2021 are provided in **Table 2-2**. **Figures 2-8** and **2-9** contain the most recent individual site-related VOC results collected since 2018 across all properties from the shallow/intermediate and deep monitoring wells, respectively.

The following discussion summarizes the remaining concentrations observed based on groundwater monitoring events that have taken place over the past several years.

As shown on **Figure 2-7**, concentration reductions in groundwater were observed throughout the ERH treatment area between 2016 and 2021. Concentrations of 1,1,1-TCA were reduced in all monitored wells except MHBP-21D, which is located approximately 20 feet downgradient of the Area B treatment zone and was historically non-detect for site-related COCs prior to April 2017. Well MHBP-11 contained a maximum of concentration of 430,000 µg/L in January 2016. Concentrations of 1,1-DCA, 1,1-DCE and 1,2-DCA were significantly reduced, although concentrations of these compounds remained above criteria in select wells.

Table 2-2 indicates that since January 2018, well MHBP-11 had low levels of site-related COCs until the November 2021 groundwater monitoring event, during which 1,1,1-TCA, 1,1-DCA and Chloroethane were detected above the AWQS. CVOC concentrations in well MHBP-12 have remained low, with none of these compounds detected at levels above the AWQS. Since January 2018, CVOC concentrations in well MHBP-13S have remained relatively low; however, 1,1-DCA, 1,2-Dichlorobenzene and Chloroethane were detected above the AWQS in November 2021. Additionally, MHBP-21D has continued to contain elevated site-related CVOCs, with 1,1-DCA, 1,1-DCE and vinyl chloride at concentrations in exceedance of the AWQS for those compounds. In November 2021, monitoring well MHC-29 contained detectable concentrations of site-related COCs, none of which exceeded the AWQS. Groundwater collected from wells OBG-7S and OBG-7I did not contain any detectable VOCs, consistent with historical data.

Acetone, which was observed at high concentrations during ERH treatment, has generally been non-detect during recent groundwater monitoring events, except in MHBP-11.

Emerging contaminant samples (PFAS and 1,4-Dioxane) were collected from select wells in May 2018 and November 2021, along with quality assurance/quality control samples (refer to **Table 2-13**). In May 2018, while none of the samples collected from the MHBP Treatment Area contained concentrations of 1,4-Dioxane above the NYSDOH maximum contaminant level (MCL) in effect at the time, one well sampled for PFAS (OBG-8S) contained 17 ng/L of PFOS, which exceeded the NYSDOH MCL of 10 ng/L for that compound. **Table 2-13** compares the May 2018 results to the Proposed NYSDEC AWQ GV for emerging contaminants, indicating that wells OBG-7S, OBG-7I and OBG-8S contained 1,4- Dioxane at concentrations that were non-detect or below the criterion. OBG-8S also contained PFOA at 6.9 B ng/L, which is slightly above the AWQ GV for the compound.

In November 2021, three of the wells sampled in the MHBP Treatment Area for emerging contaminants contained exceedances of the Proposed AWQ GV for PFOA and/or PFOS: MHBP-11, MHBP-13S, and MHC-29. Laboratory results from five of the wells analyzed for 1,4-Dioxane contained exceedances of the Proposed AWQ GV: MHBP-11, MHBP-12, MHBP-13S, MHBP-21D, and MHC-29. **Figures 2-10** and **2-11** contain emerging contaminant sampling results since 2018 across all properties from the shallow/intermediate and deep monitoring wells, respectively.

3. Institutional and Engineering Control Plan

3.1 General

Since remaining contamination exists at the Duso Site and MHBP Treatment Area, ICs and 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 Duso Site and MHBP Treatment Area. 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 Duso Site and MHBP Treatment Area;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs to be set forth in the Deed Restriction;
- 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 a vapor mitigation system for any new structures constructed; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the Duso Site and/or MHBP Treatment Area remedies, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs is required by the ROD to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the Duso Site and the MHBP Treatment Area to commercial or industrial uses only. Adherence to these ICs is required by the Deed Restriction as specified in the ROD and will be implemented under this SMP. The ICs identified in the Deed Restriction may not be discontinued without an amendment to or extinguishment of the Deed Restriction. The proposed IC boundaries are shown on **Figure 1-2**. These ICs are:

- Compliance with an approved site management plan.
- The Duso Site and the MHBP Treatment Area may be used for commercial or industrial uses only. The IC will restrict residential use of the area.
- Provide protections for maintenance, industrial and construction workers working in surface soils (0 to 2 ft bgs); trespassers for surface soils on the Duso Site only, and for construction workers working in subsurface soils (greater than 2 feet bgs) on the Duso Site and MHBP Treatment Area. The exposure pathway to contaminated soil, groundwater and possibly vapors by construction workers is possible. The reason for these restrictions is due to the exceedance of groundwater of Ambient Water Quality Standards (Class GA) and exceedance of soil concentrations for Restricted Use SCOs for the Protection of Public Health for Residential Use and Protection of Groundwater Soil Criteria.
- Restrict the use of groundwater as a source of potable or process water, without the necessary water quality treatment as determined by NYSDOH.
- Requirements that the property owner or designated representative to complete and submit to NYSDEC a periodic certification of institutional and engineering controls.
- Requirements that any new structures in the area of the previous groundwater contamination include sub-slab construction that allows for the installation and operation of vapor mitigation systems, or be constructed with vapor barriers incorporated into the slab.
- 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 NYSDOH or the Poughkeepsie 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 NYSDEC.
- 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.
- Provisions for the proper 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 Duso Site and MHBP Treatment Area within the IC boundaries 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 Deed Restriction.
- Continued evaluation of the potential for vapor intrusion for any buildings developed in the area within the proposed IC boundaries noted on **Figure 1-2**, including provisions for mitigation of any impacts identified.

3.3 Engineering Controls

Engineering Controls required include the SSDS in the Star Gas Office Building on the Duso Site and groundwater monitoring with monitoring well maintenance for both the Duso Site and off-site MHBP Treatment Area.

3.3.1 Sub-Slab Depressurization System

To prevent potential exposure to elevated indoor air concentrations resulting from Duso Site contaminants, a SSDS was installed in the on-site Star Gas Office Building in 2006. An as-built drawing for this system is included as **Figure 2-2**, and photographs are provided in **Appendix G**. Procedures for operating and maintaining the SSDS on the Duso Site are summarized in the Operation and Maintenance Plan (Section 5.0 of this SMP). The Vapor Intrusion Manual and the IRM Work Plan, which contain details on inspections and maintenance of the SSDS, are provided in **Appendix G**. A copy of the documents, along with the final SMP, will be maintained at the Duso Site.

3.3.2 Groundwater Monitoring

Groundwater monitoring activities to evaluate the performance of the EISB remedial activities on the Duso Site and the ERH Treatment in the MHBP Treatment Area will continue until residual groundwater concentrations are found to be consistently below ambient water quality standards, the SCGs, or have become asymptotic at an acceptable level over a two-year period.

Procedures for groundwater monitoring activities and monitoring well maintenance are documented in the Monitoring and Sampling Plan (Section 4.0 of the SMP). **Figure 1-2** shows the locations of the monitoring wells to be included in the network.

3.3.3 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the ROD. The framework for determining when remedial processes are complete is provided in Section 6.6 of NYSDEC DER-10. The NYSDEC will issue an Acknowledgement of Satisfaction to the applicable property owners when these criteria are met as per the terms of the Master Agreement with the applicable property owners, at which time monitoring, inspecting, and reporting will no longer be required.

3.3.3.1 Groundwater Monitoring

In the event that groundwater monitoring data indicates that monitoring may no longer be required, a proposal to discontinue monitoring will be submitted by the remedial party. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional source removal, treatment and/or control measures will be evaluated.

3.3.3.2 Sub-Slab Depressurization System

The active SSDS on the Duso Site will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that monitoring data indicates that the SSDS may no longer be required, a proposal to discontinue the SSDS will be submitted by the remedial party to the NYSDEC and NYSDOH.

The SSDS was installed as a permanent, integral addition to the Star Gas building and creates a negative pressure field directly under the slab and around the foundation of the building. This mitigates vapor intrusion to prevent contaminant exposure to the occupants of the building.

Since groundwater is the presumed source of the PCE and TCE vapors that have migrated beneath the building, it is likely that mitigation will be necessary until groundwater concentrations decline sufficiently so that sub-slab concentrations satisfy the NYSDOH Decision Matrix 1. Active remediation via EISB was conducted to reduce groundwater CVOC concentrations. Performance monitoring of the remediation is ongoing. When groundwater concentrations reduce sufficiently, the SSDS will be turned off.

Once the SSDS system is shut down for at least six months, a full round of indoor air and sub-slab vapor samples will be collected. If these results, when compared to **Tables 2-7**, **2-8** and **2-9**, lead to the conclusion of “no further action”, “identify and reduce”, or “monitor only”, then the SSDS will remain off. If the results lead to the conclusion that mitigation is required, then the SSDS will be turned back on.

4. 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 as **Appendix H**.

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

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater standards; 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 annually beginning in 2022. The function of the SSDS on the Duso Site will be monitored periodically by Star Gas Products, Inc., by checking the U-tube manometer. If the owner observes a change in the manometer reading, they will contact the NYSDEC. Detailed instructions were provided in the September 14, 2016 letter from the NYSDEC to the property owner, which is included in **Appendix G**. 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, the inspection forms will be completed as provided in **Appendix I** – 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;
- Confirm occupancy or non-occupancy of the MHBP Building, including the former Staples space;
- 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.

Inspections of all remedial components installed at the Duso 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 Deed Restriction;
- Achievement of remedial performance criteria; and
- If site records are complete and up-to-date.

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. 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 Post-Remediation Media Monitoring and Sampling (Duso Site and MHBP Treatment Area)

Samples will be collected from the on-site groundwater monitoring wells on the Duso Site and the MHBP Treatment Area on a periodic basis. Sample type, required analytical parameters, and schedule are provided in **Table 4-1** below. Modification to the frequency or sampling requirements will require approval from the NYSDEC. Analytical procedures and protocols are provided in the QAPP in **Appendix H,** and detailed sample collection procedures are provided in **Appendix J** (Field Procedures) and in the sections below.

Table 4-1. Post-Remediation Sampling Requirements and Schedule

Monitoring Event[2]	Analytical Parameters[1]				Schedule
	VOCs (US EPA Method 8260C)	Dehalobacter (DHB), Dehalococc-oides (DHC) & Vinyl Chloride Reductase (VCR)	Monitored Natural Attenuation Parameters[3]	VOCs (TO-15 Low Level)	
Groundwater Monitoring on Duso Site	X	X	X		Every five quarters
Groundwater Monitoring on MHBP Treatment Area	X	X	X		Every five quarters
SSDS Mitigation System in Star Gas Building on the Duso Site				X	Monitoring only required due to unacceptable performance, preventative maintenance, repairs and/or adjustments made to the SSDS.

Notes:

1. Preliminary site screening for emerging contaminants (PFAS and 1,4-dioxane) was performed in May 2018. Appropriate analytical procedures and sampling protocols are provided in **Appendix H** and **Appendix J**, respectively.

2. Specific monitoring well and sample locations are provided in the following sub-sections.

3. Monitored Natural Attenuation (MNA) parameters include: TOC (United States Environmental Protection Agency [US EPA] SM 5310B); chloride (SM4500Cl), sulfate (US EPA Method 300), sulfide (US EPA Method SM4500S-F), and Dissolved Gases (Methane, ethane, and ethene; Method RSK 175); and field parameters (pH, ORP, DO, specific conductivity, temperature).

4.3.1 Groundwater Sampling

Groundwater monitoring will be performed every five quarters to assess groundwater conditions following the EISB remedial activity on the Duso Site and the ERH Treatment in the MHBP Treatment Area. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

For the EISB remedial activity, EVO injections, as discussed in Section 2.5.2.1, was selected for its long-lasting persistence as a carbon substrate in the subsurface. Effects of the EISB continued over a number of years, but elevated CVOC concentrations, including chloroethane, remain on the Duso Site. Persistent chloroethane concentrations detected in groundwater that cannot be treated via ERD is a common occurrence with this technology. At a minimum, long-term monitored natural attenuation of persistent COCs will be conducted on the Duso Site.

Baseline MNA sampling has been performed in the MHBP Treatment Area. The results from this baseline event are being used for comparisons of MNA monitoring results to evaluate changes over time in the MHBP Treatment Area and to assess if groundwater conditions on the Duso Site are migrating to the MHBP Treatment Area.

In the event that the desired treatment results for the Duso Site are not observed after long-term monitoring for COCs, a polishing step may be required to address residual impacts and/or to act as a barrier to prevent recontamination of the MHBP Treatment Area. This action, if determined necessary, will be discussed with and will require approval from the NYSDEC.

The monitoring well network has been designed to monitor upgradient, on-site and downgradient groundwater conditions at the Duso Site and MHBP Treatment Area. Fifteen (15) monitoring wells as specified in **Table 4-2** will be included in the monitoring well network that is sampled regularly. During the November 2021 groundwater monitoring event, groundwater elevation gauging was conducted in order to develop groundwater contour maps of both the Duso Site and MHBP Treatment Area (refer to **Appendix F**).

Samples will be analyzed for the parameters reported in **Table 4-1** and **Table 4-2** to assess the performance of both of the remedies. Monitoring well locations are provided on **Figure 1-2**. Details of the monitoring well network are included in **Table 4-2.**

Table 4-2 – Monitoring Well Network Details

Monitoring Well ID	Well Location	Analytes	Sampling Frequency	Screen Interval (ft bgs)
MHBP-11	MHBP Treatment Area	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	10-20
MHBP-12	MHBP Treatment Area	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	10-20
MHBP-13S	MHBP Treatment Area	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	10-20
MHBP-21D	Downgradient of MHBP Treatment Area	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	15-25
MHC-29	MHBP Treatment Area	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	10-20
OBG-7S	Downgradient of MHBP Treatment Area	VOCs/MNA	Every five quarters	4.8-9.8
OBG-7I	Downgradient of MHBP Treatment Area	VOCs/MNA	Every five quarters	19.4-29.4
MHC-25S	Duso Site	VOCs/MNA	Every five quarters	4-14
MHC-23	Duso Site	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	3-13
MHC-26	Duso Site	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	3-13
BIW-1S	Duso Site	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	6-16
BIW-1D	Duso Site	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	19-26
BIW-2S	Duso Site	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	4-9
BIW-5S	Duso Site	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	5-12
BIW-5D	Duso Site	VOCs/MNA/DHB/ DHC/VCR	Every five quarters	15-20

The geologic cross-sections are included in **Appendix E**, which illustrate the monitoring well screened interval, depth and geologic unit in which the well was constructed. Monitoring well boring logs and construction details can be located in the historical remedial investigation and design documents referenced in Section 8. **Appendix F** contains groundwater contours, which include baseline water level measurements and flow patterns.

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.

4.3.1.1 Monitoring and Sampling Protocol

Prior to sample collection, depth to water measurements will be collected with an electronic water level meter from all accessible wells the same day. Prior to measuring, the wells will be opened and allowed to equilibrate to atmospheric pressure. After equilibration, depth to water measurements will be taken to the hundredth of a foot.

Following water level measurements, low-flow sampling techniques will be used in accordance with Groundwater Sampling Guidelines for Superfund and RCRA Project Managers (US EPA OSWER 542-S-02-001). The default groundwater sampling method will be in accordance with US EPA's low stress, often referred to as low flow, sampling technique (Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, US EPA/540/S-95/504) and is discussed below.

A peristaltic pump (or similar adjustable flow rate pump) will be used to purge the wells. The pump intakewill be set at the midpoint of the saturated screened interval. The pump will be operated at a flow rate of approximately 100 to 500 milliliters per minute (mL/m) and water levels will be monitored to ensure that the pumping rate causes minimal/no drawdown. Dedicated tubing will be used for groundwater sample collection. Field parameters will be recorded on the Well Sampling Form every five minutes duringpurging and will include:

- Purge rate (mL/min)
- Depth to water (0.01 ft)
- Temperature (degrees Celsius)
- pH
- Specific conductance (millisiemens per centimeter [ms/cm])
- Dissolved Oxygen (DO) (milligrams per liter [mg/L])
- Oxidation-Reduction Potential (ORP) (millivolts [mV])
- Turbidity (NTU)

A flow-through cell will be used to obtain temperature, pH, specific conductance, DO, and ORP. Turbidity will be measured using a separate instrument. Purging will be considered complete when the indicator parameters have stabilized over three consecutive readings. Stabilization parameters include the following:

- Drawdown: less than 0.3 ft drawdown during purging;
- pH: ± 0.1 standard unit
- Specific Conductivity: ± 3%
- DO: ± 10 % (mg/L) for values greater than 0.5 mg/L or 3 readings < 0.5 mg/L
- ORP: ±10 mV
- Turbidity: < 5 NTU or ± 10% for readings >5 NTU

During sample collection, the flow-through cell will be disconnected, and the sample tubing discharge will be directed into the laboratory-supplied sample containers. The target flow rate will be approximately 100 mL/m during sample collection for VOC analysis. Once sampling is complete, the purge water will be placed in a NYSDOT-approved 55-gallon drum for off-site disposal as non-hazardous waste pending analysis of the groundwater samples, unless otherwise directed by the NYSDEC. **Appendix J** includes detailed procedures for sample collection and handling and waste handling, and **Appendix H** contains the analytical QAPP for site management activities. **Appendix K** contains the site-specific HASP for site management activities.

4.3.1.2 Sample Packaging and Shipping

Samples collected for laboratory analysis will be transported to the laboratory or delivered via FedEx to the laboratory on the day of collection if possible; otherwise samples will be delivered on the day after collection, following proper identification, chain-of-custody, preservation, and packaging procedures. The selected laboratory shall be accredited under New York State Department of Health/Environmental Laboratory Accreditation Program (NYSDOH/ELAP). Standard operating procedures (SOPs) for sample handling, storage, and shipping are included in **Appendix J**.

A properly completed chain-of-custody form will accompany each sample shipment. The sample identifiers will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to the laboratory, or to/from a secure storage area.

Samples will be properly packaged to avoid breakage, stored on ice at 4° C for shipment and dispatched to the laboratory for analysis. In the event that samples must be held overnight prior to shipment, the temperature of the cooler and presence of sufficient ice will be checked and new ice added prior to shipment. A signed chain-of-custody form will be enclosed and secured to the inside top of each sample box or cooler. The chain-of-custody (white copy), a cooler receipt form (if applicable), and any additional documentation will be placed in a plastic bag to prevent them from getting wet, and one copy will be retained by the field team leader.

Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. Signed custody seals will be covered with clear plastic tape. The cooler will be taped shut with strapping tape in at least two locations. Sample shipments will follow NYSDOT and International Air Transport Association (IATA) regulations and documentation.

4.3.1.3 Field Records and Documentation

The objective of this subsection is to provide consistent procedures and formats by which field records will be kept and activities documented. Field records and documentation to be used during field activities include field logbooks and standard forms. Standard forms include chain-of-custody forms and well sampling forms. Blank forms are provided in **Appendix I**.

Logbook entries will be recorded in indelible, waterproof ink. If errors are made in any field logbook, field record (form), chain-of-custody, or any other field record document, corrections will be made by crossing a single line through the error, entering the correct information, and initialing and dating the correction. **Appendix J** includes an SOP for logbook entries.

4.3.1.4 Decontamination Procedures

To avoid cross-contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated according to the procedures discussed below.

Cross-contamination is minimized by the use of vendor-decontaminated, dedicated, disposable equipment to the extent practical. Personnel decontamination is discussed in the site-specific Health and Safety Plan (HASP) (**Appendix K**), and an SOP for decontamination is provided in **Appendix J**.

Small equipment decontamination for non-disposable equipment such as water level meters and submersible pumps will be accomplished using the following procedures:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse; and,
- Distilled/deionized water rinse.

Solvents will not be used in the field decontamination of such equipment. Decontamination will include scrubbing/washing with a laboratory grade detergent (e.g., Alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses. Tap water may be used from any treated municipal water system; the use of an untreated potable water supply is not an acceptable substitute.

Equipment should be allowed to dry prior to use. Steam cleaning or high-pressure hot water cleaning may be used in the initial removal of gross, visible contamination.

Electric submersible pumps (such as a Grundfos Redi-Flow II) will be decontaminated using the above steps followed by running a large volume (several gallons) of potable water through the pump, followed by an analyte-free water rinse. Tubing will not be reused (new tubing will be used for each well). Submersible pumps and supporting lines and cables will be placed in a plastic bucket filled with Liquinox and potable water and then run for several minutes (to decontaminate both exterior and interior parts). The process will be repeated with potable water. Submersible pumps will also be given a final analyte-free water rinse of both interior and exterior parts.

If bladder pumps are used, the pump will be disassembled and cleaned after each use. A new bladder will be used for each sample. Small parts, such as screens and gaskets will be replaced after each use.

Dedicated airline tubing and Teflon sample tubing will be used at each monitoring well. The pump will be cleaned using the following steps:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse; and,
- Distilled/deionized water rinse, air dry.

4.3.1.5 Management of Investigation Derived Waste

Investigation-Derived Waste (IDW) management will be in accordance with Section 3.3(3e) of NYSDEC's DER-10. The sampling methods and equipment will be selected to limit both the need for decontamination and the volume of IDW. Personal protective equipment and disposable sampling equipment will be placed in plastic garbage bags for disposal as a solid waste. Types of IDW expected to be generated as part of the site management activities include monitoring well purge water and decontamination water; however, soil cuttings may also be produced in the event that additional soil sampling takes place at the Site. Groundwater sampling purge water will be placed into 55-gallon, NYSDOT-approved drums until such a time as general sampling data indicates that the materials may be disposed on-site. An SOP for IDW management is included in **Appendix J**.

4.3.2 Well Repair and/or Replacement

If biofouling or silt accumulation occurs in the 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 the repair or decommissioning and replacement of any monitoring well, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report (PRR). 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 "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.

4.3.3 Soil Vapor Intrusion Sampling

Generally, air monitoring is not recommended if the SSDS has been installed properly and is maintaining a vacuum beneath the building. Performance monitoring of the SSDS may be required in the Star Gas building due to unacceptable performance issues, preventative maintenance, repairs and/or adjustments made to the SSDS.

In the event sampling is required within any buildings associated with the Former Duso Chemical Site or Adjacent Mid-Hudson Business Park, the following text summarizes the sampling protocol.

Sampling will be performed in accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006; updated September 2013, August 2015 and May 2017). All samples will be collected in certified SUMMA canisters provided by the laboratories. 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.

Any SVI sampling that may be required is based on the sampling conducted for the 2006 IRM. Prior to obtaining samples, a pre-sampling survey will be conducted to establish current building conditions and to identify items or occupant activities that could contribute to a presence of target VOCs in the structure (Section 4.3.4). Sampling will include the following:

- Sub-slab pressure differential monitoring at one sample location to demonstrate a negative pressure field;
- The collection of one indoor air sample (Star-IA);
- The collection of one outdoor air sample each day of sample collection (Star-AA); and
- Sample analysis for VOCs by method TO-15 Low Level (LL).

The outdoor ambient air sample will be collected concurrently with the indoor air sample to determine the extent to which outdoor sources may be influencing indoor air quality within the sampling area. Both samples will be collected over a 12-hour period.

Deliverables for the SVI sampling program are specified in Section 7.0, and procedures for collection of indoor and outdoor air samples are provided below.

As specified in the SVI guidance, to reduce the potential for interference and dilution effects, to the extent practicable, the occupants of the buildings to be sampled will be requested to refrain from the activities listed below for the 24-hour period prior to and during the ambient air sampling collection:

- Opening any windows, fireplace dampers, openings or vents;
- Operating any ventilation fans unless special arrangements are made;
- Smoking in the building;
- Painting;
- Using a wood stove, fireplace, or other auxiliary heating equipment (e.g., kerosene heater);
- Operating or storing an automobile in the building or an attached garage;
- Allowing containers of gasoline or oil to remain within the building or garage area, except for fuel oil tanks;
- Cleaning, waxing or polishing furniture, floors or other woodwork with petroleum or oil-based products;
- Using air fresheners, scented candles or odor eliminators;
- Engaging in any hobbies that use materials containing volatile chemicals;
- Using cosmetics including hairspray, nail polish, nail polish removers, perfume/cologne, etc.;
- Lawn mowing, paving with asphalt, or snow blowing;
- Applying pesticides; and,
- Using building repair or maintenance products, such as caulk or roofing tar.

The indoor and outdoor air samples will be collected from the breathing zone height (i.e., 4 to 6 ft above the floor). A section of disposable Teflon-lined tubing will be extended from the Summa canister to collect the indoor and outdoor air samples from the breathing zone.

The field sampling team will maintain a sample log sheet summarizing the sample identification; date and time of sample collection; identification of samplers; sampling methods and devices utilized; vacuum of canisters before and after samples are collected; and sample analyses.

4.3.4 Building Survey and Product Inventory

As required by the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006; updated September 2013 and August 2015), a building survey will be performed each time air samples are collected to identify and minimize conditions that may interfere with the proposed testing prior to collecting samples at each structure. The building survey will evaluate the type of building structure, floor layout, air-flow patterns (e.g., using smoke tubes), and the physical condition of the buildings being studied. Information obtained during the building survey, including information on sources of potential indoor air contamination, will be identified on the NYSDOH Indoor Air Quality Questionnaire and Building Inventory Form (NYSDOH, 2006; Appendix B). Information to be evaluated and noted during the building survey includes the following:

1. Occupant name(s) and address;
2. Owner or landlord information;
3. Building characteristics (e.g., commercial/industrial, number of units/tenants, number of floors, building age, etc.);
4. Construction characteristics including foundation cracks and utility penetrations; ceiling construction and firewall separations; or other openings that may serve as preferential pathways for vapor intrusion;
5. Heating, ventilation, and air conditioning systems including the type of heating system(s); type of fuel used; presence of a boiler/furnace; presence of aboveground or underground storage tanks; type(s) of air conditioning; and the presence of air distribution ducts;
6. Occupancy and the general use;
7. Factors that may influence indoor air quality including attached garages; separate heating units in the garage; petroleum-powered machines stored in the garage; workshop or craft area; smoking in the building; exhaust fans in the kitchen or bathrooms; new carpets; fresh paints, etc.; and
8. Type of water supply and sewage disposal.

A product inventory will be provided by the Star Gas property owner to identify chemicals and products that may bias sampling results. Product names and chemical ingredients listed on container labels will be provided. If the ingredients are not listed on the label, the product's exact and full name, and manufacturer information, will be provided. Chemicals or products that are noted as being stored in a questionable manner (e.g., in an open container), that emit odor or yield positive field screening results, will need to be controlled during the indoor air quality sampling to reduce potential interferences. Control options will be discussed with the building occupant and will include removal of the container (preferred option) or tightly sealing the containers.

The presence and description of odors and portable vapor monitoring equipment readings (e.g., photoionization detector (PID) readings) will be noted. Photographs will also be taken as appropriate during the building survey. Floor plans will be sketched to indicate sub-slab soil vapor and indoor air sampling locations, possible indoor air pollution sources, and PID meter readings. The PID meter will have a minimum detection limit of 1 ppb.

4.3.5 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in **Appendix I** - Site Management Forms. Other observations (e.g., cracks in flooring, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network.

5. Operation and Maintenance Plan

5.1 General

The groundwater component of the Duso Site remedy does not rely on any mechanical systems to protect public health and the environment. Therefore, the Operation and Maintenance Plan included in this SMP pertains only to the SSDS system in the Star Gas building on the Duso Site and provides a brief description of the measures necessary to operate, monitor, and maintain the mechanical components of these systems. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the Duso Site to operate and maintain the SSDS system; and,
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS system is operated and maintained.

Further detail regarding the Operation and Maintenance of the SSDS is provided in **Appendix G,** which includes a copy of the IRM Work Plan and the Vapor Intrusion Mitigation System Owner's Manual (Vapor Intrusion Manual). A copy of the documents, along with the final SMP, will be maintained at the Duso Site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Operation and Maintenance of Sub-Slab Depressurization System

The following sections provide a description of the operations and maintenance of the SSDS system located at the Star Gas facility. An as-built drawing for this system is provided on **Figure 2-2** and photographs are provided in **Appendix G**.

5.2.1 System Start-Up and Sampling

In order to activate the SSDS, the following general steps are required. The Vapor Intrusion Manual and the IRM Work Plan provided in **Appendix G** should be referenced when performing any inspections or maintenance of the SSDS system.

1. Turn on power supply for sub-panel at each building's main breaker panel (located outside on pedestal);
2. Turn on all breakers in sub breaker panel located on the pedestal outside each building;
3. Confirm that the valves located immediately above each of the SSDS suction points are fully open;
4. Turn switch for blower enclosure exhaust fan (located on exterior of enclosure) to on position; and,
5. Balance the flow between the two suction points with a hot-wire anemometer or similar air velocity measuring device.

Sampling will be performed as described in detail in Section 4 of this SMP to ensure the SSDS is performing as designed. Also, Section 2.5 includes the indoor air guidelines.

The system activation and sampling described above will be conducted if, in the course of the SSDS lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

5.2.2 Routine System Operation and Maintenance

Continuous operation of the SSDS is required in order to prevent soil vapors from potentially impacting the indoor air quality of the Star Gas building. Therefore, regular maintenance of the SSDS is required and should be strictly adhered to in order to ensure proper system operation and in an attempt to prevent future system failures. The maintenance program summarized below should be followed only when the NYSDEC provides instructions to do so. The components of the SSDS subject to maintenance include the following:

- SSDS Point (SSP1)
- U-Tube Manometer (static pressure indicator)
- Blower Enclosure Exhaust Fan
- Inlet Dilution Valve
- 4” Diameter Exhaust Stack

The property owner/tenant will assume primary responsibility for verifying the SSDS operation through periodic checks of the U-tube manometer installed at SSP1. The owner/tenant will contact the NYSDEC at 888-459-8667 for any of the following reasons:

- Changes in the manometer reading are observed;
- In the event that any remodeling of the structure or additions to the structure are planned that effect the building footprint;
- If the exhaust fan is not operating;
- If there is any standing water or flooding observed in the basement;
- If any new combustion appliance or exhaust system is installed; or
- If the property is sold.

The SSDS should also be inspected on a routine basis by Star Gas Products, Inc. in accordance with the September 14, 2016 letter from the NYSDEC to the property owner (**Appendix G**). When required by the NYSDEC or NYSDOH, a detailed inspection will take place:

- The inspection will consist of a visual inspection of the components both indoors and outdoors.
- An inspection of the fan will focus on noise, vibration, and operational issues.
- Piping, piping connections and piping supports will be checked.
- Inspection of the exhaust or discharge point to verify no air intakes have been located nearby.
- Manometer readings at the fan and at SSP1 will be recorded and compared to commissioned values. If the readings indicate possible degradation of the sub-slab depressurization, communication testing will be conducted to evaluate whether the depressurization had dropped below 0.002”wg. If it has, the system will be modified and re-commissioned.
- Inspections and tests will be documented.

As appropriate, preventative maintenance, repairs and/or adjustments should be made to the SSDS by a qualified person. If significant changes to the SSDS are made or when performance is unacceptable, the SSDS may need to be redesigned and restarted. Generally, air monitoring is not recommended if the SSDS has been installed properly and is maintained a vacuum beneath the building. The necessity of continued SSDS operation will be reviewed and decided upon by the NYSDEC and NYSDOH.

6. 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 identifies and provides a summary of vulnerability assessments that will be conducted for the Duso Site during periodic assessments. Potential vulnerabilities, two of which are related to the on-site SSDS, include the following:

- High Wind: The stack installed outside of the Star Gas Building may be susceptible to damage from the wind itself or falling objects such as utility structures during periods of high wind. A photograph of the SSDS stack is provided in **Appendix G**.
- Electricity: SVI mitigation systems are susceptible to power loss and/or dips/surges in voltage during severe weather events, including lightning strikes.
- Drainage swale (former railroad Right-of-Way): While it is unlikely that flooding or site/storm water drainage will become an issue at the Duso Site or MHBP Treatment Area considering that a drainage swale exists between the two properties, the swale discharges to the City of Poughkeepsie Municipal Separate Storm Sewer System (MS4). The swale is susceptible to transport of contaminants during a rain event if a spill or other discharge were to occur.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation Policy 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 green remediation evaluations to be completed for the Duso Site and MHBP Treatment Area during site management, and as reported in the Periodic Review Report (PRR).

Due to the nature of the remedies of both sites and the site management requirements, the areas for green remediation evaluations are limited but may include the following:

- Energy usage – The primary energy use expected for site management activities includes continued operation of the SSDS. Additional energy usage would occur during groundwater and, if applicable, soil monitoring activities. These activities will require the use of batteries and/or gasoline-powered engines or generators as power sources.
- Emissions – Discharged vapor/emissions from the SSDS installed at the Duso Site does not require mitigation or treatment before being emitted to the atmosphere. In the event that soil samples are collected, likely via a Geoprobe® rig, emissions would be generated during operation of the rig. Additionally, travel to and from the Site would result in emissions from the vehicle(s) being driven.
- Water usage – Water usage for site management activities will be limited to water needed for small equipment decontamination during groundwater or soil sampling, as required.
- Waste Generation – IDW will be generated as a result of any invasive field activities including groundwater and soil sampling. Purge water, soil cuttings, and decontamination water shall be

placed in 55-gallon, NYSDOT-approved drums for analysis and off-site disposal until the waste analysis indicates that the materials do not exceed applicable SCGs and may be disposed on-site. Personal protective equipment and disposable sampling equipment will be placed in plastic garbage bags for disposal as a solid waste.

6.2.1 Timing of Green Remediation Evaluations

Although not anticipated for these site management activities, 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 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the sites and use of consumables in relation to visiting the sites in order to conduct system checks and/or collect samples, and shipping samples to a laboratory for analysis, 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 in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources. Consideration has been given to:

- Reduced sampling frequencies –Monitoring well network sampling will occur at a frequency of every five quarters.
- Coordination/consolidation of activities to maximize foreman/labor time and to reduce the commuter miles to and from the Site.

6.3 Remedial System Optimization

A RSO study will be conducted any time 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 Remedial Action Objectives (RAOs) in the time frame estimated in the ROD;
- 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; or
- 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 focus 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. Reporting Requirements

7.1 Site Management Reports

All site management inspection, maintenance, and monitoring events will be recorded on the appropriate site management forms provided in **Appendix I**. Revisions of these forms are subject to NYSDEC approval.

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 7-1** and summarized in the PRR.

Table 7-1: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Groundwater Monitoring Reports	Every five quarters
Site-Wide Inspection (including all monitoring wells)	Annually
Periodic Review Report	Annually

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

All interim monitoring/inspection 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., groundwater, sub-slab vapor, indoor air, outdoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- 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 ASP Category B laboratory data deliverables required for all points sampled (to be submitted electronically to the NYSDEC data processor in EQuIS™ 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 (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 (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, 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 NYSDEC in 2023. After submittal of the initial PRR, the next PRR shall be submitted annually to the NYSDEC or at another frequency as may be required by the Department. While the Duso Site and MHBP Treatment Area are divided into separate parcels with different ownership, a single PRR will be prepared that addresses the Site as described in **Appendix B** - Deed Restriction/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 PRR for the particular reporting period. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site;
- Results of the required scheduled 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;
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor), 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; and
- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the ROD;
  - 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;
- Trends in contaminant levels to determine if the remedy continues to be effective in achieving remedial goals as specified by the ROD; and
- The overall performance and effectiveness of the remedy.

For sites whose remedial programs are State-funded, a quantitative and qualitative overview of a site's environmental impacts must be provided through the completion of the Summary of Green Remediation Metrics provided in **Appendix L**. This form as well as a summary of the Green Remediation evaluation will be included in the Periodic Review Report.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare, and include in the PRRs, 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 NYSDEC;*
- *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 NYSDEC 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."

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 institutional or engineering control, 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), an RSO report must be submitted to the NYSDEC for approval. 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.

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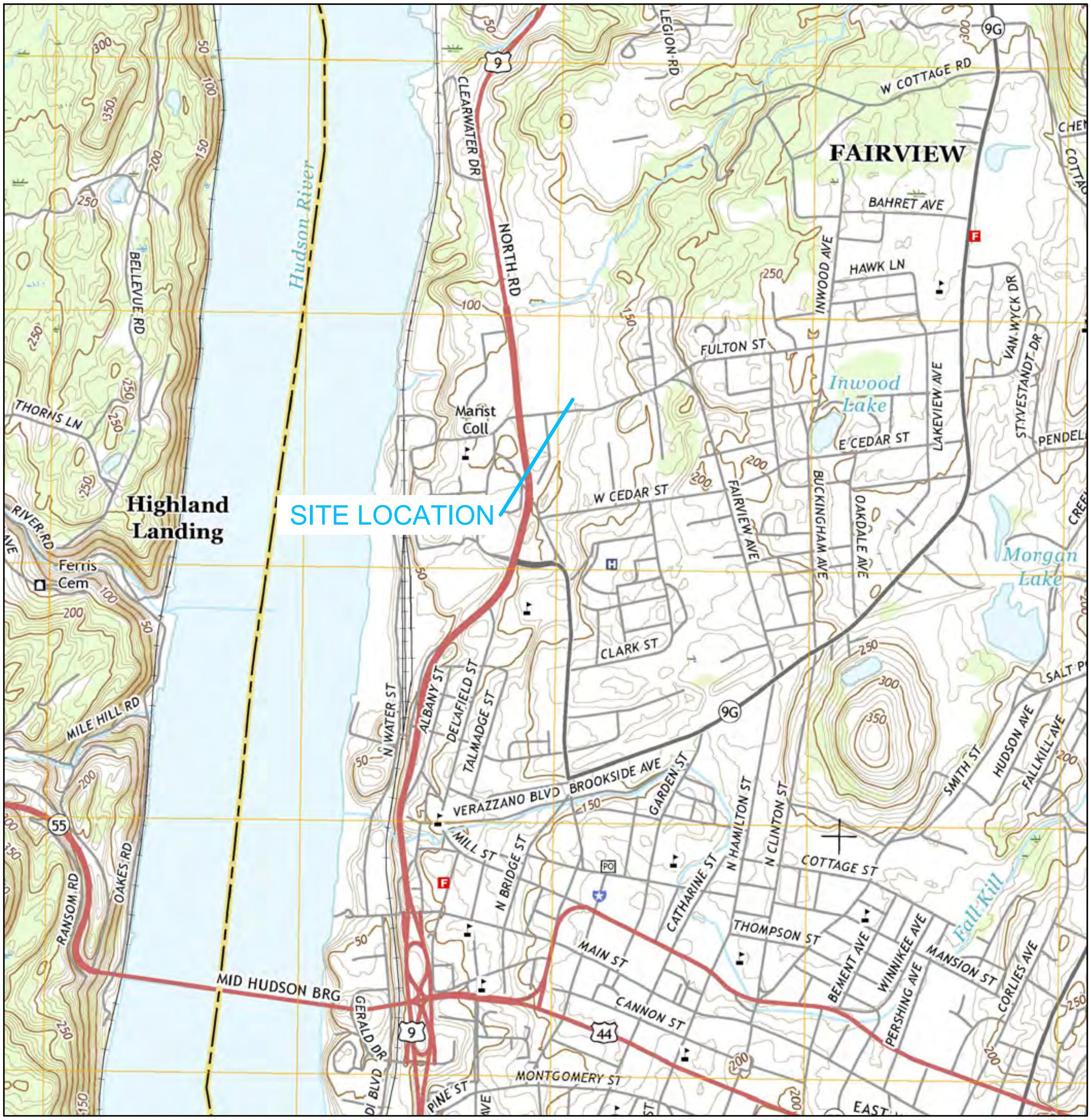
FIGURES



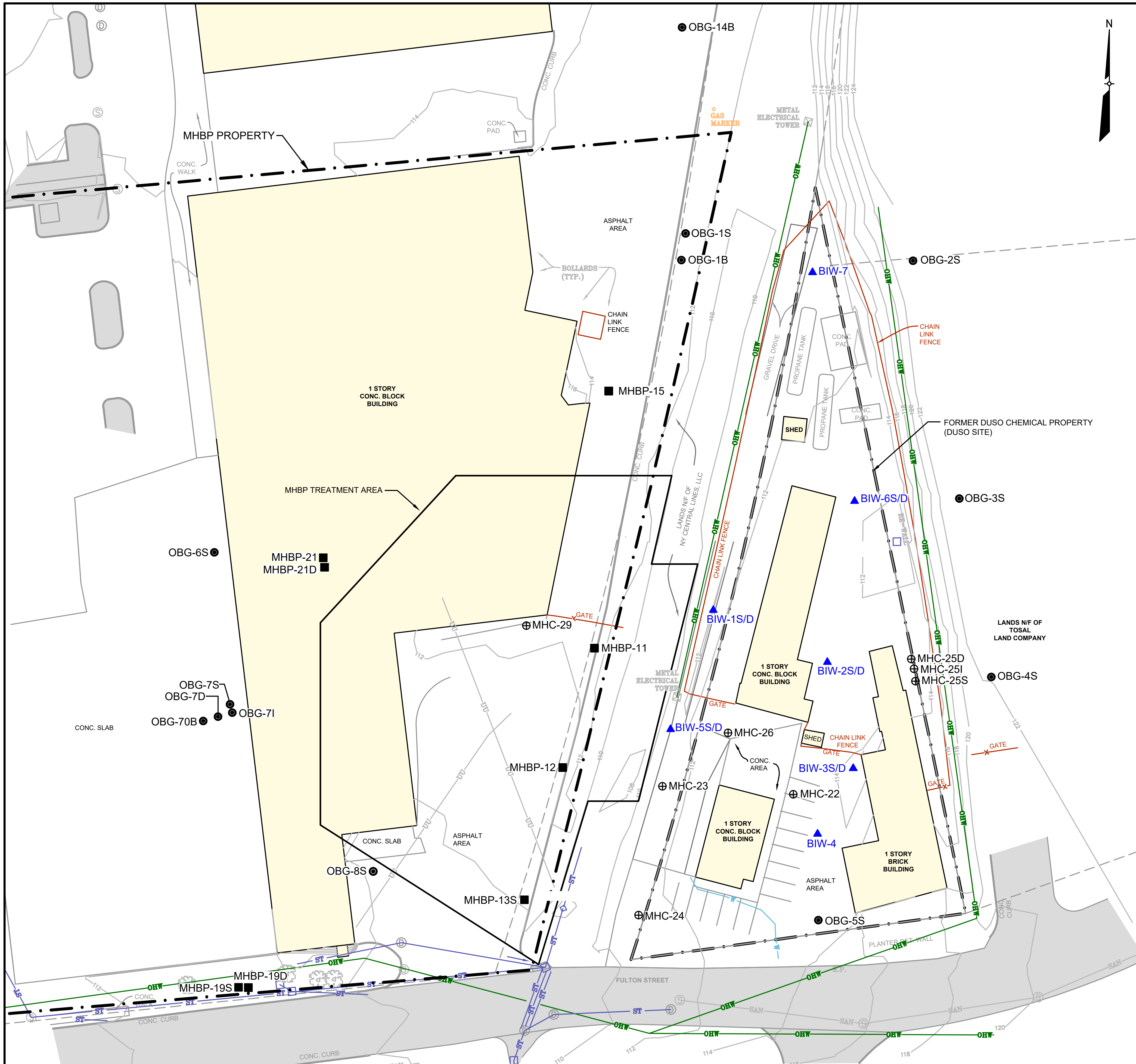
0' 2000' 4000'

NOTE: MAP DERIVED FROM U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, POUGHKEEPSIE, NY, DATED 2016.

FORMER DUSO CHEMICAL FACILITY
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, NEW YORK
Project No.: 60647169 Date: 2022/03/28

SITE LOCATION MAP

Figure: 1-1



LEGEND

BIW-1S/D ▲	BIOREMEDIATION INJECTION WELL LOCATION (2012)
OBG-2S ⊙	O'BRIEN & GERE WELL LOCATION (2005 & 2007) (APPROXIMATE)
MHBP-11 ■	MID-HUDSON BUSINESS PARK WELL LOCATION (1993-1994, 2015)
MHC-30 ⊕	WELL LOCATION (1990s)
	CATCH BASIN
	MANHOLES
	TREES
	BUILDING
	ROAD / PAVEMENT
	TOPOGRAPHIC CONTOURS
	PROPERTY BOUNDARY
	FENCE (APPROXIMATE)
	PARCEL BOUNDARY
	OVERHEAD WIRES
	UNDERGROUND WATER
	SANITARY SEWER LINE
	STORMWATER LINE
	UNKNOWN UNDERGROUND UTILITIES
	UNDERGROUND GAS
	MHBP TREATMENT AREA (APPROXIMATE IC BOUNDARIES)
	DUSO SITE BOUNDARY (APPROXIMATE IC BOUNDARIES)

0 55 110

SCALE IN FEET

SOURCE: - BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.
- MHBP AND MHC WELL LOCATIONS FROM COORDINATES IN GROUNDWATER SAMPLING FIELD SHEET SUMMARY SPREADSHEET, PROVIDED BY CHAZEN.

AECOM

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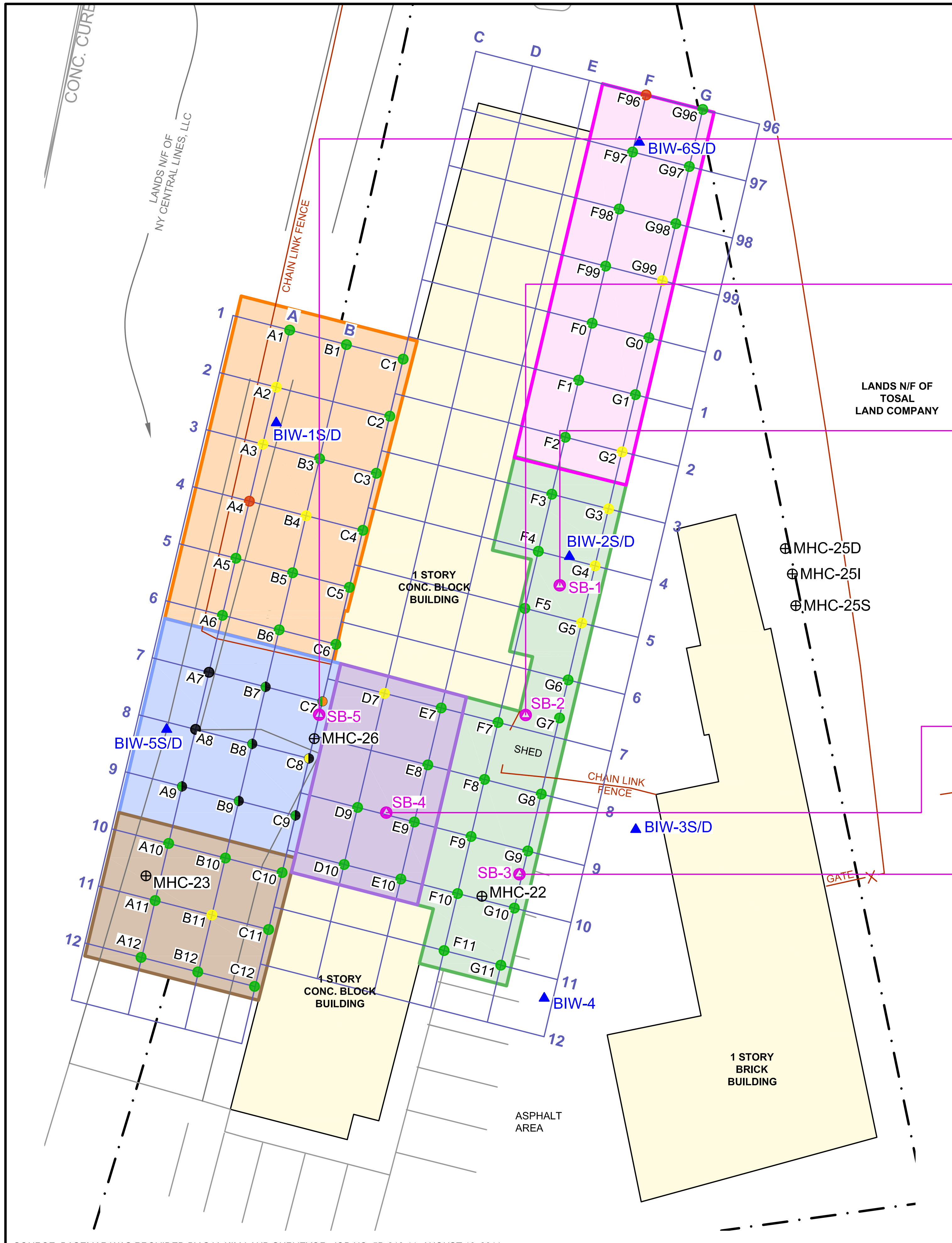
FIGURE 1-2
SITE PLAN AND MONITORING WELL LOCATIONS

FORMER DUSO CHEMICAL FACILITY
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2022 60647169



Soil Boring ID and Sample Depth	SB-5 (1-2')
Date	6/19/2013
1,1,1-Trichloroethane	ND
1,1-Dichloroethane	230 J
Tetrachloroethene	11,000
Trichloroethene	85,000 D

Soil Boring ID and Sample Depth	SB-2 (1-2')
Date	6/19/2013
1,1,1-Trichloroethane	ND
1,1-Dichloroethane	ND
Tetrachloroethene	11,000 D
Trichloroethene	550

Soil Boring ID and Sample Depth	SB-1 (3-4')
Date	6/19/2013
1,1,1-Trichloroethane	580
1,1-Dichloroethane	390
Tetrachloroethene	4,900
Trichloroethene	11,000 D

Soil Boring ID and Sample Depth	SB-4 (2-3')
Date	6/19/2013
1,1,1-Trichloroethane	ND
1,1-Dichloroethane	ND
Tetrachloroethene	5,400
Trichloroethene	22,000 D

Soil Boring ID and Sample Depth	SB-3 (1-2')
Date	6/19/2013
1,1,1-Trichloroethane	ND
1,1-Dichloroethane	ND
Tetrachloroethene	28,000
Trichloroethene	4,500

LEGEND

- INJECTION POINT - ZVI ONLY
- COMPLETED INJECTION POINT EVO/ZVI
- COMPLETED INJECTION POINT EVO
- TARGET EVO VOLUME NOT REACHED
- INJECTION POINT ELIMINATED
- SHALLOW SOIL BORINGS
- BIW-1S/D BIOREMEDIATION INJECTION WELL LOCATION (2012)
- OBG-2S O'BRIEN & GERE WELL LOCATION (2005 & 2007)
- MHC-30 WELL LOCATION (1990s)
- BUILDING
- ROAD / PAVEMENT
- PROPERTY BOUNDARY (APPROXIMATE)
- FENCE (APPROXIMATE)

N

INJECTION POINT COORDINATES

Well ID	Northing	Easting	Well ID	Northing	Easting
A1	1053537.99	648104.38	E7	1053460.62	648135.43
A2	1053526.31	648101.62	E8	1053448.94	648132.67
A3	1053514.63	648098.86	E9	1053437.26	648129.91
A4	1053502.95	648096.10	E10	1053425.58	648127.15
A5	1053491.27	648093.34	F96	1053586.14	648177.40
A6	1053479.59	648090.59	F97	1053574.46	648174.64
A7	1053467.90	648087.83	F98	1053562.78	648171.88
A8	1053456.22	648085.07	F99	1053551.10	648169.13
A9	1053444.54	648082.31	F0	1053539.41	648166.37
A10	1053432.86	648079.55	F1	1053527.73	648163.61
A11	1053421.18	648076.79	F2	1053516.05	648160.85
A12	1053409.53	648073.90	F3	1053504.37	648158.09
B1	1053535.01	648116.01	F4	1053492.69	648155.33
B2	1053523.33	648113.25	F5	1053481.01	648152.57
B3	1053511.65	648110.49	F7	1053457.65	648147.06
B4	1053499.97	648107.73	F8	1053445.97	648144.30
B5	1053488.29	648104.97	F9	1053434.29	648141.54
B6	1053476.61	648102.21	F10	1053422.61	648138.78
B7	1053464.93	648099.45	F11	1053410.93	648136.02
B8	1053453.25	648096.70	G96	1053583.16	648189.03
B9	1053441.57	648093.94	G97	1053571.48	648186.27
B10	1053429.89	648091.18	G98	1053559.80	648183.51
B11	1053418.21	648088.42	G99	1053548.12	648180.75
B12	1053406.56	648085.53	G0	1053536.44	648177.99
C1	1053532.04	648127.63	G1	1053524.76	648175.24
C2	1053520.36	648124.88	G2	1053513.08	648172.48
C3	1053508.68	648122.12	G3	1053501.40	648169.72
C4	1053497.00	648119.36	G4	1053489.72	648166.96
C5	1053485.32	648116.60	G5	1053478.04	648164.20
C6	1053473.64	648113.84	G6	1053466.36	648161.44
C7	1053461.96	648111.08	G7	1053458.55	648159.67
C8	1053450.27	648108.32	G8	1053442.99	648155.92
C9	1053438.59	648105.57	G9	1053431.31	648153.17
C10	1053426.91	648102.81	G10	1053419.63	648150.41
C11	1053415.23	648100.05	G11	1053407.95	648147.65
C12	1053403.58	648097.16			
D7	1053463.60	648123.80			
D8	1053451.92	648121.04			
D9	1053440.24	648118.28			
D10	1053428.56	648115.52			

0 12.5 25 50
SCALE IN FEET

NOTES

AREA	POINTS	INJECTION INTERVAL (ft bgs)	VOLUME PER POINT (gallons)	VOLUME PER FOOT (gallons)
NORTHEAST	14	4-12 (8')	333	42
EAST AREA	17	4-16 (12')	596	50
CENTER AREA	8	4-18 (14')	700	50
NORTHWEST	18	6-26 (20')	800	40
WEST CENTER	9	4-10 (6') EOS 10-24 (14') EHC	390 (EOS) 420 (EHC)	65 (EOS) 30 (EHC)
SOUTHWEST	9	4-24 (20')	800	40

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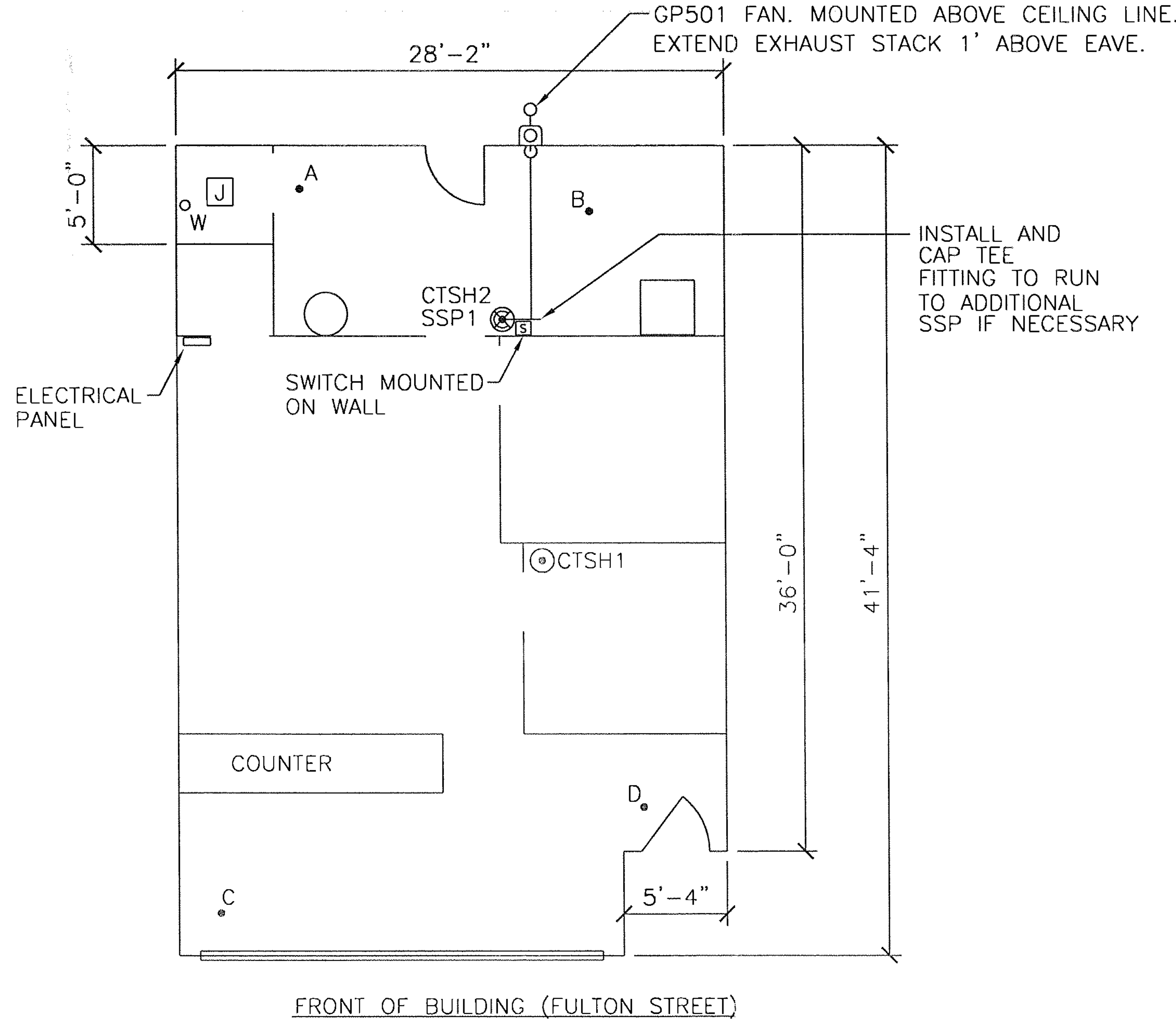
FIGURE 2-1
BIOREMEDIATION INJECTION PLAN SUMMARY

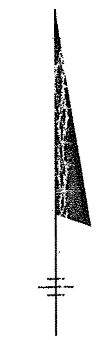
FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MAY 2017 60647169

SOURCE: BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.

DWG PATH: 35919\ASBUILT.DWG





FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. DIMENSIONS SHOWN ON FIGURE ARE APPROXIMATE INSTALLATION LOCATIONS AND SHALL BE FIELD VERIFIED BY INSTALLATION CREW.
2. INSTALLATION CREW SHALL GROUT AND/OR CAULK ALL MAJOR CRACKS AND OPENINGS THAT WOULD IMPAIR VENTILATION SYSTEM PERFORMANCE.
3. INSTALLATION CREW SHALL DETERMINE ELECTRICAL TIE-IN LOCATION OF JUNCTION BOX.
4. INSTALLATION CREW SHALL SECURE EQUIPMENT AND PIPING TO PREVENT ANY MOVEMENT.
5. INSTALLATION CREW SHALL INSTALL A BLADEX VALVE ON EACH SYSTEM SUCTION POINT.
6. * DENOTES ASBESTOS SAMPLE IDENTIFICATION

Plot Date: 10/19/05 EMA

Figure 2-2

SSDS As-Built, Star Gas Products, Inc. Office Building (Former Duso Chemical Site)

ASBUILT 02/07/06

LEGEND

- S — SEWER
- G — NATURAL GAS
- W — WATER
- E — ELECTRICAL
- HVAC — HVAC DUCT
- PIPE/DUCT DOWN
- PIPE/DUCT UP
- EXISTING WALL
- WINDOW
- DOOR
- STAIRWAY
- HOT WATER TANK (HWT)
- BOILER
- FURNACE
- JUNCTION BOX
- FAN SWITCH
- CIRCUIT BREAKER PANEL
- SUMP PUMP
- FLOOR DRAIN
- COMMUNICATION TEST SUCTION HOLE (CTSH)
- COMMUNICATION TEST SUCTION HOLE AND SYSTEM SUCTION POINT
- SYSTEM SUCTION POINT (SSP)
- COMMUNICATION TEST POINT (CTP)
- NEW EXHAUST RISER PIPE
- NEW EXHAUST PIPE

FORMER DUSO CHEMICAL SITE
INTERIM REMEDIAL MEASURE

FIRST FLOOR PLAN
STAR GAS PRODUCTS

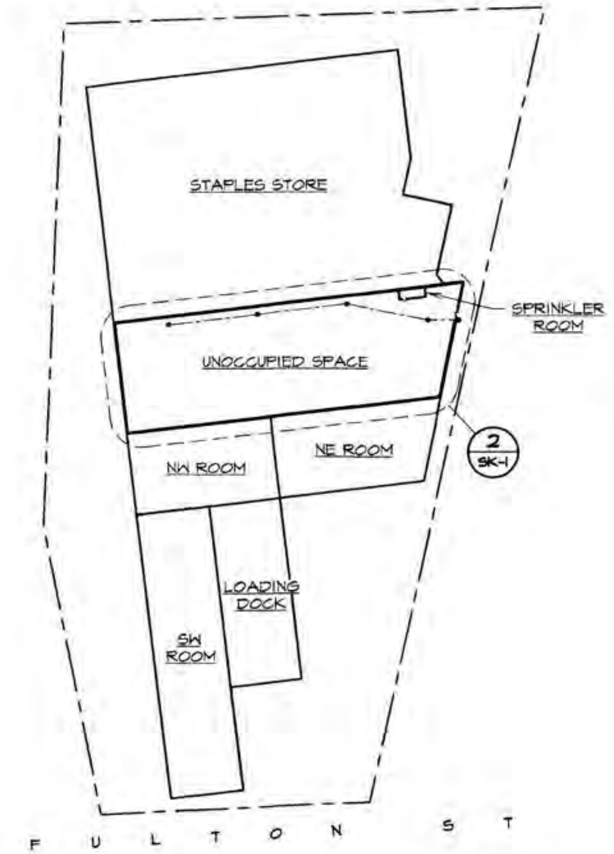
33 FULTON STREET
SITE NO. 3-14-103

8 0 8

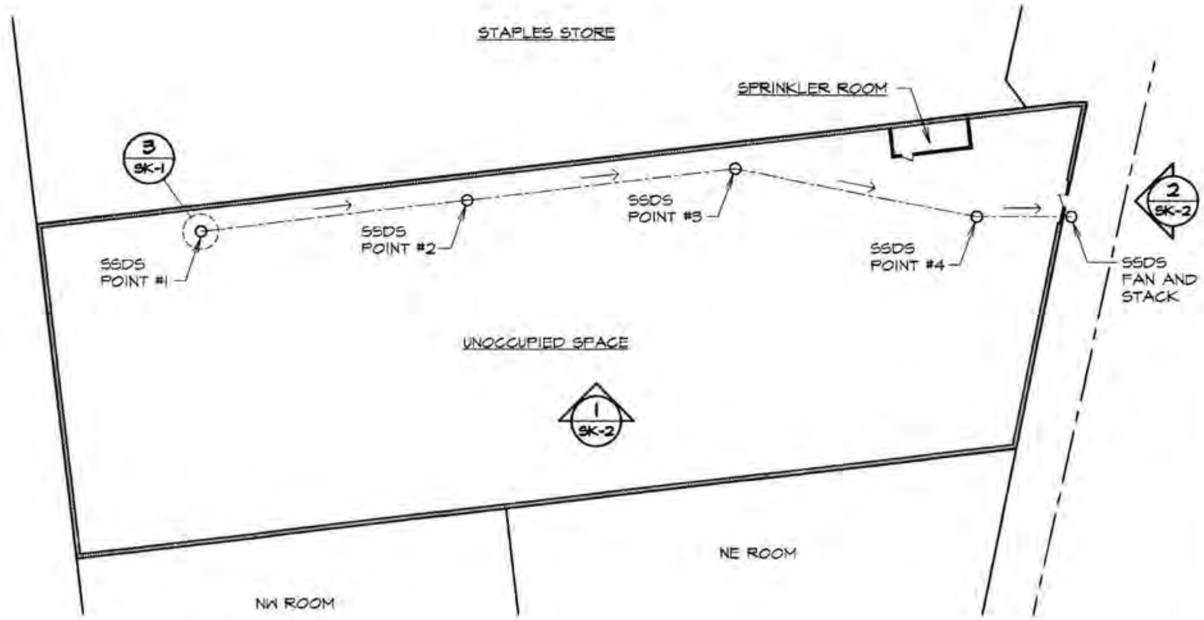
1/8"=1'-0"

FILE NO. 35919.004
OCTOBER 18, 2005

O'BRIEN & GERE ENGINEERS INC.



1 SK-1 SITE PLAN
SCALE: N.T.S.



2 SK-1 FLOOR PLAN - 'UNOCCUPIED SPACE" - BUILDING UNIT
SCALE: N.T.S.

SEALAND ENVIRO
AN O'CONNELL COMPANY

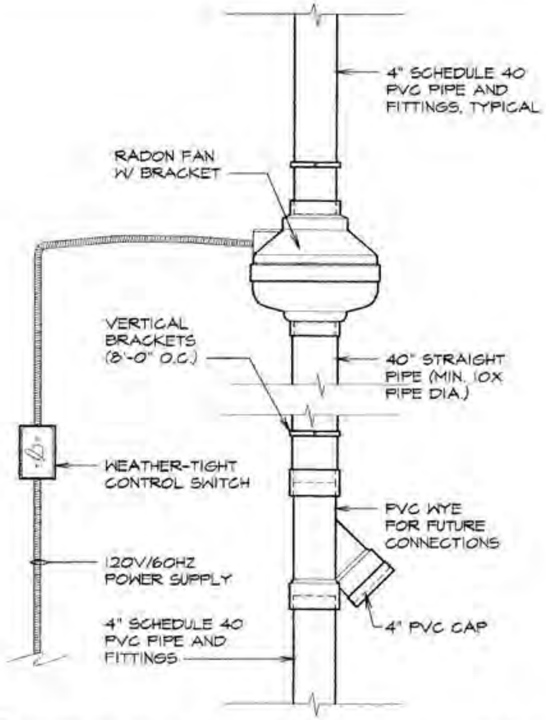
Sealand Enviro, LLC
58 Pomfret Street
Putnam, CT 06260
T: 978.490.5268
F: 860.315.9019
www.sealandenviro.com

DUSO Chemical Remediation Project
33 Fulton Street, Poughkeepsie, Dutchess County, NY

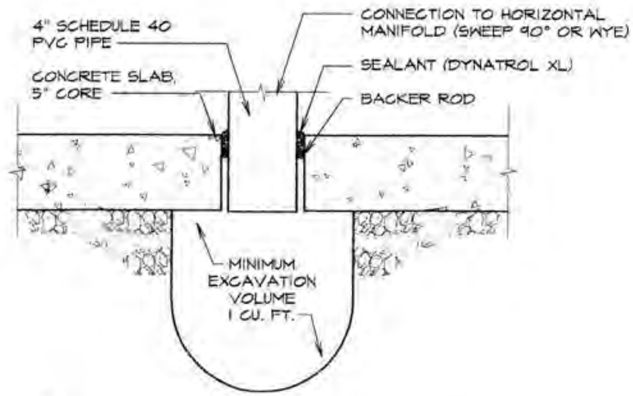
SSDS Layout
MHBP Treatment Area

Project Number:	SE 2014-001
Date:	18 April, 2015
Drawn by:	CRR

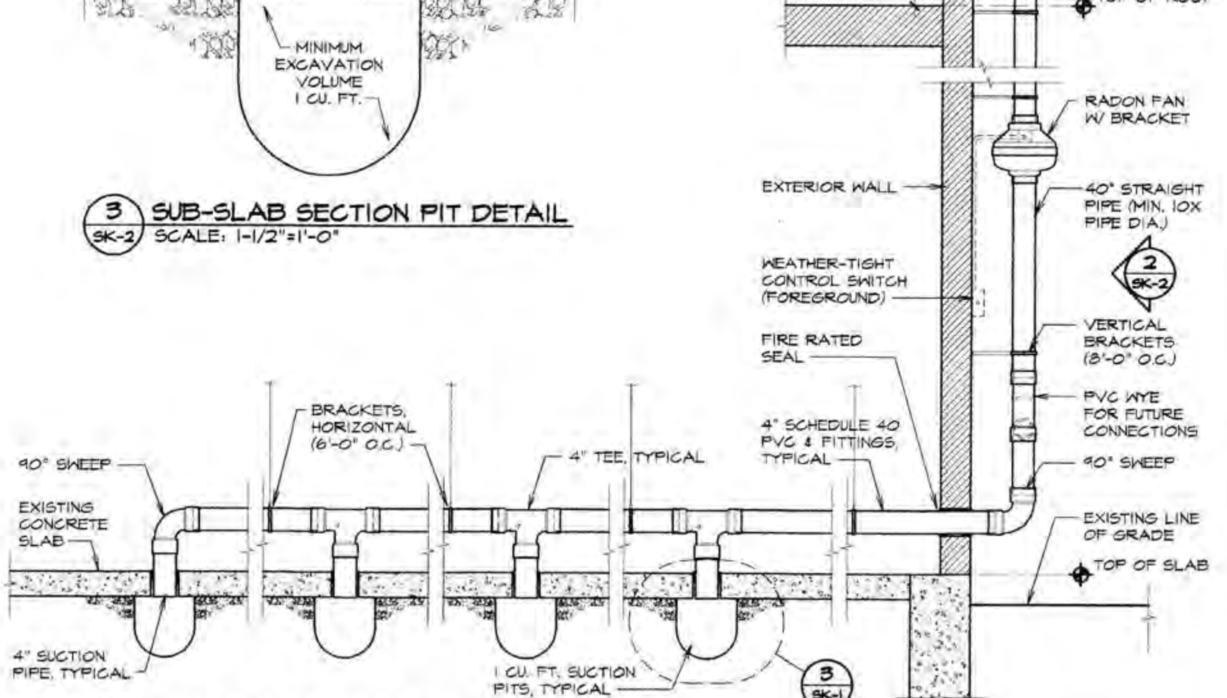
Figure 2-3



2 / SK-2 **SUB-SLAB DEPRESSION RISER DETAIL**
SCALE: 1"=1'-0"



3 / SK-2 **SUB-SLAB SECTION PIT DETAIL**
SCALE: 1-1/2"=1'-0"



1 / SK-2 **SUB-SLAB DEPRESSION PIPING LAYOUT**
SCALE: 1/2"=1'-0"

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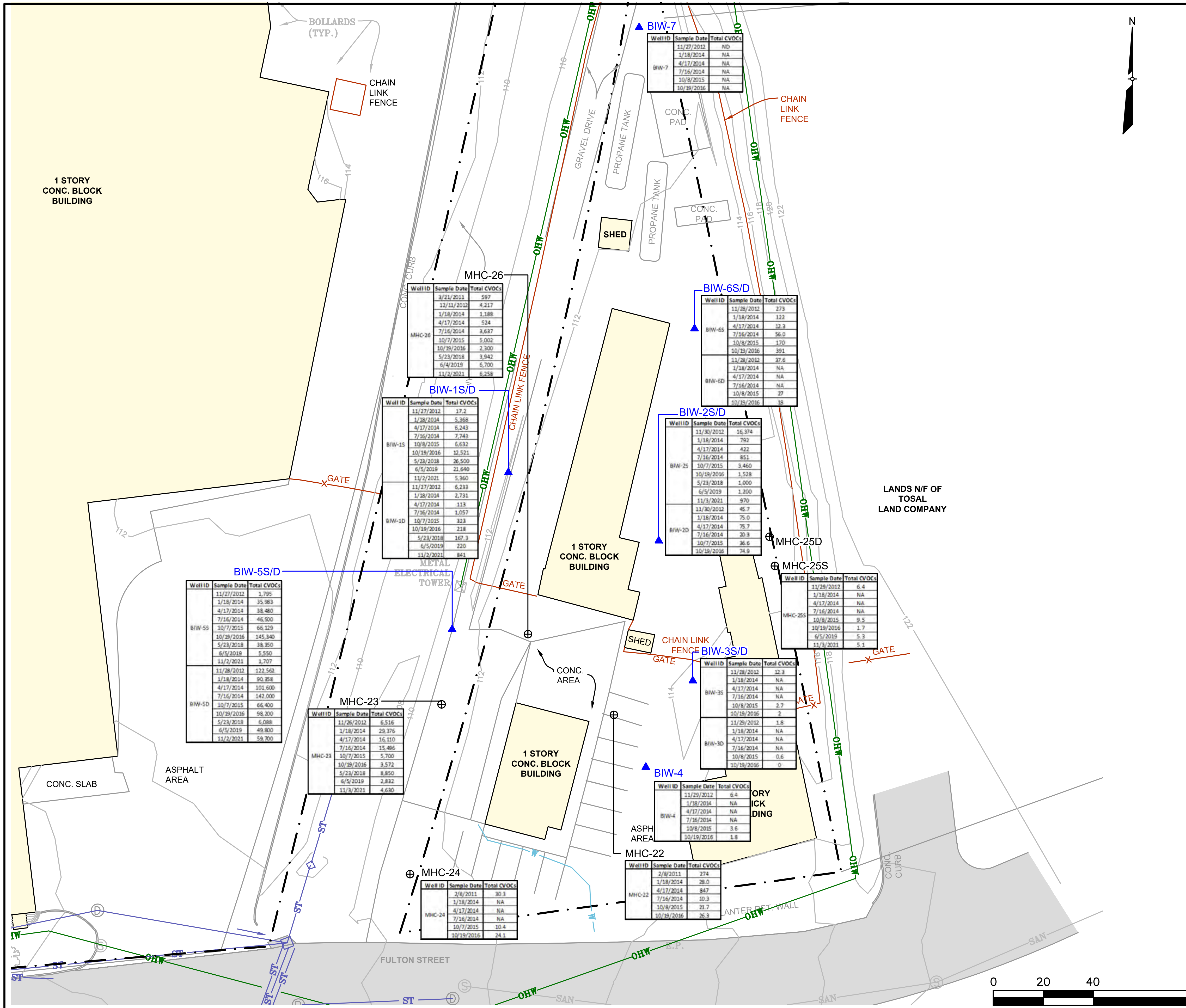
DUSO Chemical Remediation Project
33 Fulton Street, Poughkeepsie, Dutchess County, NY

SSDS As-Built
MHBP Treatment Area

Project Number:	SE 2014-001
Date:	18 April, 2015
Drawn by:	CRR

Figure 2-4



Well ID	Sample Date	Total CVOCs
BIW-7	11/27/2012	ND
	1/18/2014	NA
	4/17/2014	NA
	7/16/2014	NA
	10/8/2015	NA
	10/19/2016	NA

Well ID	Sample Date	Total CVOCs
MHC-26	3/21/2011	597
	12/11/2012	4,217
	1/18/2014	1,188
	4/17/2014	524
	7/16/2014	3,637
	10/7/2015	5,002
	10/19/2016	2,300
	5/23/2018	3,942
	6/4/2019	6,700
	11/2/2021	6,258

Well ID	Sample Date	Total CVOCs
BIW-6S	11/28/2012	273
	1/18/2014	122
	4/17/2014	12.3
	7/16/2014	56.0
	10/8/2015	170
	10/19/2016	391
BIW-6D	11/28/2012	37.6
	1/18/2014	NA
	4/17/2014	NA
	7/16/2014	NA
	10/8/2015	27
	10/19/2016	18

Well ID	Sample Date	Total CVOCs
BIW-1S	11/27/2012	17.2
	1/18/2014	5,368
	4/17/2014	6,243
	7/16/2014	7,743
	10/8/2015	6,632
	10/19/2016	12,521
	5/23/2018	26,500
	6/5/2019	21,640
	11/2/2021	5,360
BIW-1D	11/27/2012	6,233
	1/18/2014	2,731
	4/17/2014	113
	7/16/2014	1,057
	10/7/2015	323
	10/19/2016	218
	5/23/2018	167.3
	6/5/2019	220
	11/2/2021	841

Well ID	Sample Date	Total CVOCs
BIW-2S	11/30/2012	16,374
	1/18/2014	792
	4/17/2014	422
	7/16/2014	851
	10/7/2015	3,460
	10/19/2016	1,528
	5/23/2018	1,000
	6/5/2019	1,200
	11/3/2021	970
BIW-2D	11/30/2012	45.7
	1/18/2014	75.0
	4/17/2014	75.7
	7/16/2014	20.3
	10/7/2015	36.6
	10/19/2016	74.9

Well ID	Sample Date	Total CVOCs
MHC-25S	11/29/2012	6.4
	1/18/2014	NA
	4/17/2014	NA
	7/16/2014	NA
	10/8/2015	9.5
	10/19/2016	1.7
	6/5/2019	5.3
	11/3/2021	5.1

Well ID	Sample Date	Total CVOCs
BIW-5S	11/27/2012	1,795
	1/18/2014	35,983
	4/17/2014	38,480
	7/16/2014	46,500
	10/7/2015	66,129
	10/19/2016	145,340
	5/23/2018	38,350
	6/5/2019	5,550
	11/2/2021	1,707
BIW-5D	11/28/2012	122,562
	1/18/2014	90,358
	4/17/2014	101,600
	7/16/2014	142,000
	10/7/2015	66,400
	10/19/2016	98,200
	5/23/2018	6,088
	6/5/2019	49,800
	11/2/2021	59,700

Well ID	Sample Date	Total CVOCs
BIW-3S	11/28/2012	12.3
	1/18/2014	NA
	4/17/2014	NA
	7/16/2014	NA
	10/8/2015	2.7
	10/19/2016	2
BIW-3D	11/29/2012	1.8
	1/18/2014	NA
	4/17/2014	NA
	7/16/2014	NA
	10/8/2015	0.6
	10/19/2016	0

Well ID	Sample Date	Total CVOCs
MHC-23	11/26/2012	6,516
	1/18/2014	29,376
	4/17/2014	16,110
	7/16/2014	15,496
	10/7/2015	5,700
	10/19/2016	3,572
	5/23/2018	8,850
	6/5/2019	2,832
	11/3/2021	4,630

Well ID	Sample Date	Total CVOCs
BIW-4	11/29/2012	6.4
	1/18/2014	NA
	4/17/2014	NA
	7/16/2014	NA
	10/8/2015	3.6
	10/19/2016	1.8

Well ID	Sample Date	Total CVOCs
MHC-22	2/8/2011	274
	1/18/2014	28.0
	4/17/2014	847
	7/16/2014	10.3
	10/8/2015	21.7
	10/19/2016	26.3

Well ID	Sample Date	Total CVOCs
MHC-24	2/8/2011	30.3
	1/18/2014	NA
	4/17/2014	NA
	7/16/2014	NA
	10/7/2015	10.4
	10/19/2016	24.1

SOURCE: BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.

LEGEND

- BIW-1S/D ▲ BIOREMEDIATION INJECTION WELL LOCATION (2012)
- MHC-30 ⊕ WELL LOCATION (1990s)
- CATCH BASIN
- MANHOLES
- TREES
- BUILDING
- ROAD / PAVEMENT
- TOPOGRAPHIC CONTOURS
- PROPERTY BOUNDARY (APPROXIMATE)
- FENCE (APPROXIMATE)
- PARCEL BOUNDARY
- OVERHEAD WIRES
- UNDERGROUND WATER
- SANITARY SEWER LINE
- STORMWATER LINE
- UNDERGROUND GAS

NOTES

1. CVOC - CHLORINATED VOLATILE ORGANIC COMPOUND.
2.

Well ID	Sample Date	Total CVOCs
BIW-4	11/29/2012	6.4
	1/18/2014	NA
	4/17/2014	NA
	7/16/2014	NA
	10/8/2015	3.6
	10/19/2016	1.8

3. ALL RESULTS ARE IN MICROGRAMS PER LITER (μg/L).

0 20 40 80

SCALE IN FEET

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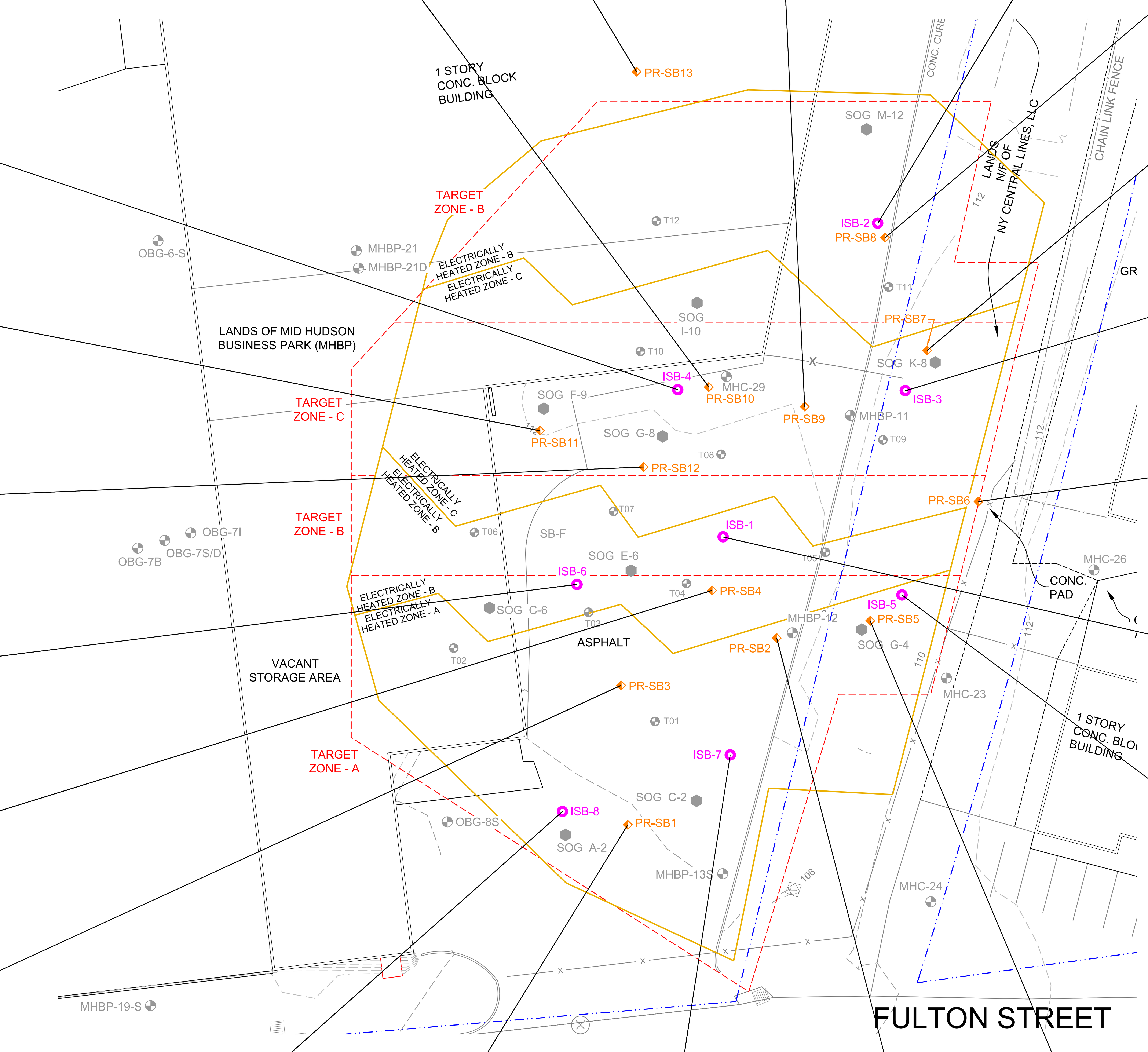
FIGURE 2-5
TOTAL CVOC ANALYTICAL RESULTS
DUSO SITE

FORMER DUSO CHEMICAL FACILITY
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2022

60647169



PR-SB10 4/28/2017		
(mg/kg)	7-8.5	18.5-20
1,1,1-TCA	0.002 U	0.002 U
1,1-DCA	**0.660**	0.002 U
1,1-DCE	**0.130**	0.003 U
1,2-DCA	**0.032**	0.002 U
acetone	**0.380**	**4.00**
chloroethane	0.017 U	0.017 U
cis-1,2-DCE	0.002 U	0.002 U
vinyl chloride	0.008 U	0.009 U

PR-SB13 5/2/2017		
(mg/kg)	8.5-9	15-17
1,1,1-TCA	0.002 U	0.002 U
1,1-DCA	0.002 U	0.002 U
1,1-DCE	0.005 U	0.004 U
1,2-DCA	0.002 U	0.002 U
acetone	0.110 U	0.099 U
chloroethane	0.023 U	0.020 U
cis-1,2-DCE	0.002 U	0.002 U
vinyl chloride	0.011 U	0.010 U

PR-SB9 4/28/2017			
(mg/kg)	3.5-5	18.5-20	Dup 18.5-20
1,1,1-TCA	**0.045**	0.002 U	0.002 U
1,1-DCA	**0.120**	**0.003**	**0.002**
1,1-DCE	**2.40**	0.003 U	0.003 U
1,2-DCA	0.002 U	0.002 U	0.002 U
acetone	0.087 U	0.079 U	**0.170**
chloroethane	0.017 U	0.016 U	0.015 U
cis-1,2-DCE	0.002 U	0.002 U	0.002 U
vinyl chloride	0.009 U	0.008 U	0.008 U

ISB-02 12/29/2016			
(mg/kg)	6-7	18-19	37-37.5
1,1,1-TCA	**9.20**	0.008 U	0.001 U
1,1-DCA	**1.50**	**1.10**	**0.003**
1,1-DCE	**1.10**	**5.20**	0.001 U
1,2-DCA	0.015 U	**0.370**	0.001 U
chloroethane	0.022 U	0.016 U	0.001 U
cis-1,2-DCE	0.012 U	0.009 U	0.001 U
vinyl chloride	0.011 U	0.008 U	0.001 U

PR-SB8 4/27/2017		
(mg/kg)	13.5-15	15-17
1,1,1-TCA	0.002 U	0.002 U
1,1-DCA	**0.004**	**0.010**
1,1-DCE	**0.025**	**0.020**
1,2-DCA	0.002 U	0.002 U
acetone	**0.470**	**0.770**
chloroethane	0.016 U	0.018 U
cis-1,2-DCE	0.002 U	0.002 U
vinyl chloride	0.008 U	0.009 U

PR-SB7 4/27/2017		
(mg/kg)	2-5	18.5-20
1,1,1-TCA	**2.20**	0.002 U
1,1-DCA	**6.30**	0.002 U
1,1-DCE	**7.20**	0.004 U
1,2-DCA	**0.042**	0.002 U
acetone	**0.20**	**0.220**
chloroethane	0.019 U	0.018 U
cis-1,2-DCE	**1.90**	0.002 U
vinyl chloride	**0.03**	0.009 U

ISB-03 12/23/2016			
(mg/kg)	7-8	19-20	48-49
1,1,1-TCA	**0.330**	0.005	0.001 U
1,1-DCA	**0.270**	**2.50**	**0.003**
1,1-DCE	**0.840**	**2.50**	0.001 U
1,2-DCA	**0.015**	**1.60**	0.002 U
chloroethane	0.001 U	0.002 U	0.002 U
cis-1,2-DCE	0.001 U	**0.014**	0.001 U
vinyl chloride	0.001 U	**0.047**	0.001 U

PR-SB6 4/27/2017		
(mg/kg)	8.5-10	12-13.5
1,1,1-TCA	**5.70**	**0.007**
1,1-DCA	**14.00**	**17.00**
1,1-DCE	**2.00**	**1.70**
1,2-DCA	**4.50**	**5.00**
acetone	0.140 U	**0.310**
chloroethane	**0.190**	0.019 U
cis-1,2-DCE	**0.006**	0.002 U
vinyl chloride	0.014 U	**0.015**

ISB-01 12/21/2016			
(mg/kg)	14-15	16-17	62-63
1,1,1-TCA	**0.080**	0.001 U	0.001 U
1,1-DCA	**17.00**	**0.093**	**0.014**
1,1-DCE	**2.60**	**0.056**	0.001 U
1,2-DCA	**1.70**	**0.029**	0.002 U
chloroethane	0.002 U	0.001 U	0.002 U
cis-1,2-DCE	0.001 U	0.001 U	0.001 U
vinyl chloride	**0.062**	**0.10**	0.001 U

ISB-05 12/23/2016			
(mg/kg)	6-7	18-19	50-51
1,1,1-TCA	**2.50**	0.001 U	0.001 U
1,1-DCA	**0.190**	**0.120**	**0.013**
1,1-DCE	**0.100**	**0.024**	**0.015**
1,2-DCA	**0.010**	**0.073**	**0.057**
chloroethane	0.002 U	0.002 U	**0.031**
cis-1,2-DCE	**0.002**	0.001 U	**0.110**
vinyl chloride	0.001 U	**0.096**	**0.078**

ISB-04 12/30/2016			
(mg/kg)	13-14	15-16	65-66
1,1,1-TCA	0.001 U	0.010 U	0.001 U
1,1-DCA	**1.30**	**2.70**	**0.006**
1,1-DCE	**0.660**	**1.70**	0.001 U
1,2-DCA	**0.048**	**0.082**	0.001 U
chloroethane	0.002 U	0.021 U	0.001 U
cis-1,2-DCE	0.001 U	0.011 U	0.001 U
vinyl chloride	0.001 U	0.010 U	0.001 U

PR-SB11 5/1/2017		
(mg/kg)	9-11	18.5-20
1,1,1-TCA	0.002 U	0.002 U
1,1-DCA	**0.0025**	0.002 U
1,1-DCE	0.004 U	0.004 U
1,2-DCA	0.002 U	0.002 U
acetone	0.110 U	0.093 U
chloroethane	0.021 U	0.019 U
cis-1,2-DCE	0.002 U	0.002 U
vinyl chloride	0.011 U	0.009 U

PR-SB12 5/1/2017		
(mg/kg)	5-7	15-17
1,1,1-TCA	0.002 U	0.002 U
1,1-DCA	**0.091**	**0.007**
1,1-DCE	**0.065**	**0.010**
1,2-DCA	**0.005**	0.002 U
acetone	0.110 U	**0.170**
chloroethane	0.022 U	0.019 U
cis-1,2-DCE	0.002 U	0.002 U
vinyl chloride	0.011 U	0.010 U

ISB-06 1/4/2017			
(mg/kg)	18-19	21-22	57-58
1,1,1-TCA	0.001 U	0.001 U	0.001 U
1,1-DCA	**0.002**	**0.009**	0.001 U
1,1-DCE	0.001 U	**0.005**	0.001 U
1,2-DCA	0.001 U	0.001 U	0.001 U
chloroethane	0.002 U	0.002 U	0.001 U
cis-1,2-DCE	0.001 U	0.001 U	0.001 U
vinyl chloride	0.001 U	0.001 U	0.001 U

PR-SB4 4/26/2017				
(mg/kg)	13.5-15	DUP 13.5-15	17-18.5	26-27.5
1,1,1-TCA	0.002 U	0.002 U	0.002 U	0.002 U
1,1-DCA	**0.050**	**0.023**	0.002 U	**0.015**
1,1-DCE	**0.037**	**0.018**	0.004 U	**0.014**
1,2-DCA	**0.008**	**0.003**	0.002 U	0.002 U
acetone	**1.70**	**1.70**	**0.540**	**0.570**
chloroethane	0.020 U	0.019 U	0.018 U	0.021 U
cis-1,2-DCE	**0.002**	0.002 U	0.002 U	0.002 U
vinyl chloride	**0.025**	**0.022**	0.009 U	0.010 U

PR-SB3 4/25/2017		
(mg/kg)	8.5-10	18.5-20
1,1,1-TCA	0.002 U	0.002 U
1,1-DCA	**2.100**	0.002 U
1,1-DCE	0.004 U	0.004 U
1,2-DCA	0.002 U	0.002 U
acetone	0.090 U	0.089 U
chloroethane	0.018 U	0.018 U
cis-1,2-DCE	0.002 U	0.002 U
vinyl chloride	**0.066**	0.009 U

ISB-08 12/19/2016			
(mg/kg)	17-18	21-22	48-49.1
1,1,1-TCA	0.001 U	0.001 U	0.002 U
1,1-DCA	**0.002**	**0.140**	**0.005**
1,1-DCE	0.001 U	0.001 U	0.002 U
1,2-DCA	**0.005**	0.002 U	**0.008**
chloroethane	0.002 U	0.002 U	**0.044**
cis-1,2-DCE	0.008 U	0.001 U	0.001 U
vinyl chloride	**0.080**	**0.093**	0.002 U

PR-SB1 4/24/2017		
(mg/kg)	5-6	16-18
1,1,1-TCA	0.002 U	0.002 U
1,1-DCA	**0.017**	0.002 U
1,1-DCE	0.004 U	0.003 U
1,2-DCA	**0.002**	0.002 U
acetone	0.100 U	**0.083**
chloroethane	0.020 U	0.016 U
cis-1,2-DCE	0.002 U	0.002 U
vinyl chloride	0.010 U	0.008 U

ISB-07 12/20/2016			
(mg/kg)	7-8	16-17	39.5-40.5
1,1,1-TCA	0.001 U	0.001 U	0.001 U
1,1-DCA	**0.120**	0.001 U	**0.011**
1,1-DCE	**0.130**	0.001 U	0.001 U
1,2-DCA	**0.018**	0.001 U	**0.002**
chloroethane	0.002 U	0.002 U	0.001 U
cis-1,2-DCE	**0.003**	0.001 U	**0.009**
vinyl chloride	0.001 U	0.001 U	**0.031**

PR-SB2 4/25/2017		
(mg/kg)	6.5-8	13.5-15
1,1,1-TCA	0.002 U	0.002 U
1,1-DCA	**13.00**	**0.029**
1,1-DCE	**0.004**	**0.028**
1,2-DCA	**3.200**	**0.006**
acetone	0.073 U	**0.780**
chloroethane	0.015 U	0.020 U
cis-1,2-DCE	0.002 U	0.002 U
vinyl chloride	**0.032**	**0.037**

PR-SB5 4/26/2017 and 4/27/2017		
(mg/kg)	7-8.5	18.5-20
1,1,1-TCA	0.002 U	0.002 U
1,1-DCA	**0.160**	0.002 U
1,1-DCE	**0.066**	0.004 U
1,2-DCA	**0.015**	0.002 U
acetone	0.091 U	**0.130**
chloroethane	0.018 U	0.018 U
cis-1,2-DCE	**0.012**	0.002 U
vinyl chloride	**0.012**	0.009 U

0 10 20 40
SCALE IN FEET

LEGEND

- APPROXIMATE SITE BOUNDARY
- FENCE LINE
- BUILDING OUTLINE
- BOLLARD
- C.B. CATCH BASIN
- MHBP-XX MONITORING WELL LOCATION
- T-XX TMW/VMP LOCATION
- SOG-XX SOIL OFF GAS WELL LOCATION
- ISB-XX APPROXIMATE INTERIM SOIL BORING LOCATION
- PR-SBX APPROXIMATE POST-REMEDIATION SOIL BORING LOCATION
- TARGET ZONE (AOC)
  - TARGET ZONE A - 5-25 FEET BGS
  - TARGET ZONE B - 5-35 FEET BGS
  - TARGET ZONE C - 5-50 FEET BGS
- ELECTRICALLY HEATED ZONE
  - HEATED ZONE A - 10-20 FEET BGS
  - HEATED ZONE B - 10-30 FEET BGS
  - HEATED ZONE C - 10-50 FEET BGS

SOIL CRITERIA

	Soil Criteria (MHBP Treatment Area - Groundwater Protection)
VOC (mg/kg)	
1,1,1-Trichloroethane	0.680
1,1-Dichloroethane	0.270
1,1-Dichloroethene	0.330
1,2-Dichloroethane	0.020
Acetone	0.050
Chloroethane	NL
cis-1,2-Dichloroethene	0.250
Vinyl chloride	0.020

NOTES

1. START OF HEATING - 12/7/2015. VAPOR RECOVERY SYSTEM STARTUP - 1/28/2016.
2. COLOR CODING:
   BOLD - DETECTED RESULT
   BLUE - EXCEEDING SOIL CRITERIA
   PINK - NON-DETECT, NOT ANALYZED
3. LOCATION SOURCES:
   - INTERIM SOIL BORING LOCATIONS WERE COLLECTED WITH A GPS UNIT.
   - POST-REMEDIATION SOIL BORING LOCATIONS ARE APPROXIMATE.
   - REMAINING LOCATIONS SOURCE: 60279080 EXISTING SITE CONDITIONS FIGURE, 7/8/2015.
   - TMW/VMP AND SOG LOCATIONS FROM CURRENT ENVIRONMENTAL SOLUTIONS, WELL LAYOUT, DATED 1/28/2015.
4. "ISB" SOIL SAMPLES WERE COLLECTED BY CHAZEN COMPANIES.
5. ACCESS TO STAR GAS PRODUCTS INC., MID-HUDSON BUSINESS PARK, AND NY CENTRAL LINES, LLC HAS BEEN OBTAINED BY THE DEPARTMENT.

NO	REVISIONS	DRN	CHK	DATE

40 British American Blvd.
Latham, New York 12110
T: (518) 951-2200
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DRN RNB 4/2018
DES
CHK
APP

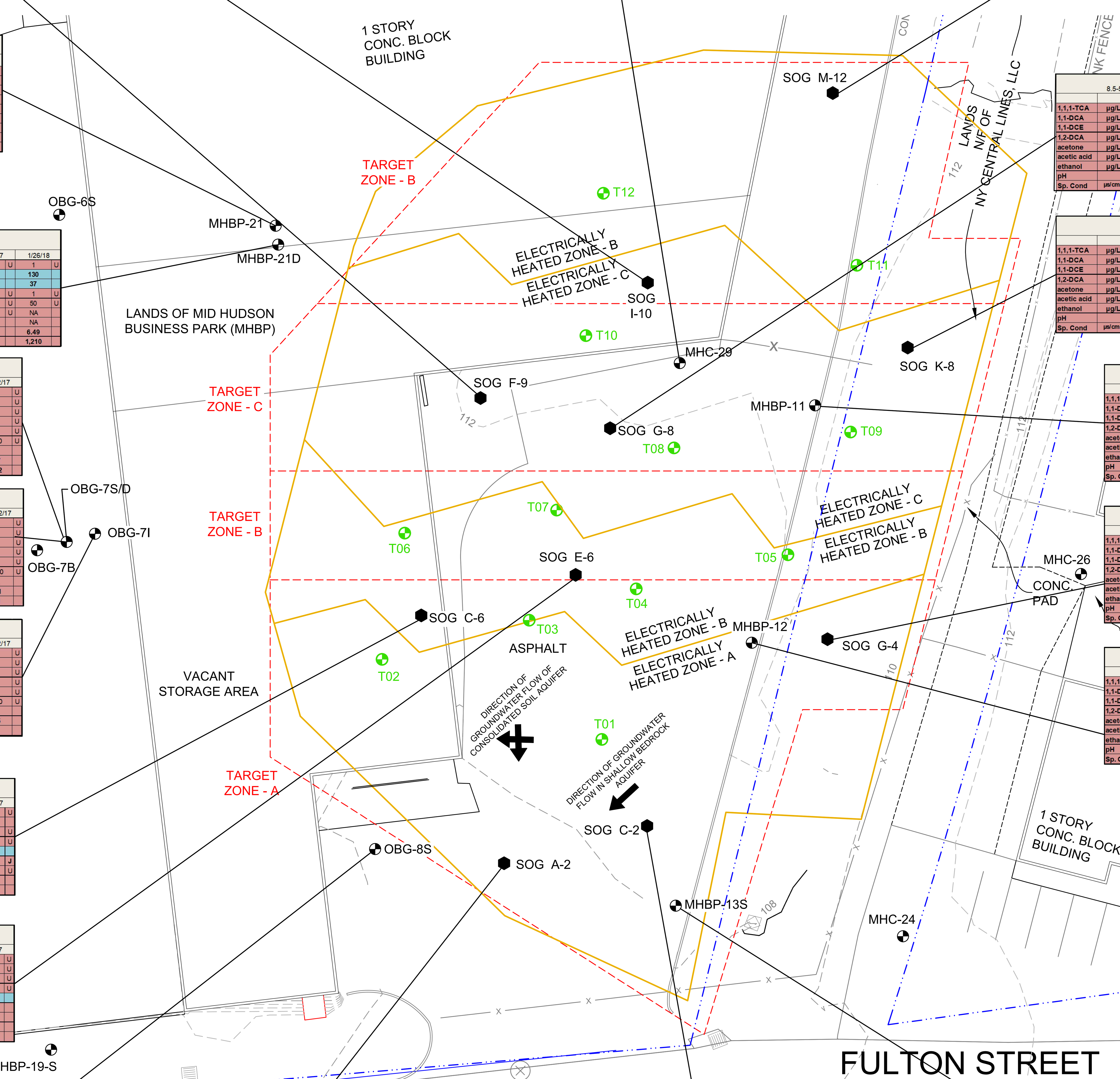
AECOM

FORMER DUSO CHEMICAL SITE
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, NY, DUTCHESS COUNTY

SOIL ANALYTICAL RESULTS DECEMBER 2016, JANUARY 2017, AND APRIL - MAY 2017

DATE: March 2022
PROJECT NO: 60647169
FILENAME: 60279080_069.dwg
SHEET NO: 1
DRAWING NO:

FIGURE 2-6



SOG F-9
8.5-53, Area C (no 12/16, 2/17, 4/17 data)

		1/6/16	3/8/16	5/3/16	7/19/16	9/23/16	7/14/17
1,1,1-TCA	µg/L	40,700	67,700 D,EB1	25,000	1,300	44	1 U
1,1-DCA	µg/L	41,800	244,400 D,EB1	91,500	5,900	480	1 U
1,1-DCE	µg/L	42 J	15,900 EB1	1,900	920	14	1 U
1,2-DCA	µg/L	51 J	440 EB1	200	100 U	8.8	2 U
acetone	µg/L	210 J	3,900	3,600	5,000 U	2,000	380
acetic acid	µg/L	NA	NA	NA	NA	NA	30,000
ethanol	µg/L	NA	NA	NA	NA	NA	500 U
pH		10.59	6.83	7.07	7.32	6.23	7.19
Sp. Cond	µs/cm^C	1,560	4,834	3,945	1,601	1,498	997

SOG I-10
8.5-53, Area C (no 12/16 or 2/17 data)

		1/5/16	3/8/16	5/3/16	7/19/16	9/22/16	4/6/17	7/13/17
1,1,1-TCA	µg/L	5,900	1,900 EB2	14	7,400	6,600	1 U	1 U
1,1-DCA	µg/L	14,800	11,600 D,EB2	440	1,200	500	5	1 U
1,1-DCE	µg/L	32	98 EB2	5	1,300	890	3	16
1,2-DCA	µg/L	45.3	61 EB2	4.3	100	100 U	1.1	2 U
acetone	µg/L	49.6	100 U	18.7	5000 U	5000 U	470	1,600
acetic acid	µg/L	NA	NA	NA	NA	NA	118,000	47,300
ethanol	µg/L	NA	NA	NA	NA	NA	1,300	500 U
pH		7.30	6.82	6.37	6.54	6.59	5.34	7.08
Sp. Cond	µs/cm^C	1,235	1,423	1,046	1,260	3,970	2,135	1,402

MHC-29
10-20, Area C

		1/6/16	3/8/16	5/1/16	7/19/16	9/23/16	12/16/16	2/8/17	4/7/17	7/13/17	1/26/18
1,1,1-TCA	µg/L	342,300	558,200	302,200	260,000	5,600	50 U	10 U	10 U	5 U	1 U
1,1-DCA	µg/L	64,000	98,700	66,800	240,000	27,000	2,600	670	500	230	5.8
1,1-DCE	µg/L	1,300	2,200	2,100	23,000	8,200	2,900	880	540	150	2.6
1,2-DCA	µg/L	3,400	5,900	5,100	13000	1,200	190	16	18	16	1 U
acetone	µg/L	630 J	5000 U	1,100	100000 U	12000 U	2,500 U	530	500 U	320	820
acetic acid	µg/L	NA	NA	NA	NA	NA	290 U	197,000	2,900 U	9,200 J	NA
ethanol	µg/L	NA	NA	NA	NA	NA	2,500 U	5,000 U	1,500	500 U	NA
pH		6.47	6.38	6.26	6.08	5.87	6.11	5.84	6.23	6.32	6.80
Sp. Cond	µs/cm^C	2,303	2,783	3,040	3,180	2,136	1,726	2,565	1,463	1,247	3,890

SOG M-12
8.5-33, Area B (no 4/17 data)

		1/6/16	3/8/16	5/3/16	7/19/16	9/23/16	12/16/16	2/7/17	7/13/17
1,1,1-TCA	µg/L	1.8	1 U	6	3	1 U	2	4	1
1,1-DCA	µg/L	250	300 D,EB1	40	99	150	140	120	22
1,1-DCE	µg/L	8	7 EB1	0.20 U	2	5.9	3	6	1.8
1,2-DCA	µg/L	1	16.9 EB1	0.61 J	1 U	1 U	2 U	2 U	2 U
acetone	µg/L	5 U	5 U	1 U	50 U	50 U	100 U	100 U	50 U
acetic acid	µg/L	NA	NA	NA	NA	NA	290 U	290 U	5,800 U
ethanol	µg/L	NA	NA	NA	NA	NA	100 U	NA	500 U
pH		6.30	6.98	6.71	6.80	7.20	7.09	6.70	6.76
Sp. Cond	µs/cm^C	842	1,172	1,213	1,260	1,837	1,926	1,762	1,161

MHBP-21
3-13, Area B (vicinity)

		1/5/16	3/9/16	5/3/16	7/19/16	9/21/16	12/14/16	2/7/17	4/7/17	7/12/17
1,1,1-TCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1	1 U	1 U
1,1-DCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1	1 U
1,1-DCE	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	2 U
acetone	µg/L	5 U	5 U	1 U	50 U	50 U	50 U	50 U	50 U	50 U
acetic acid	µg/L	NA	NA	NA	NA	NA	290 U	290 U	290 U	5,800 U
ethanol	µg/L	NA	NA	NA	NA	NA	50 U	50 U	50 U	NA
pH		7.41	7.53	7.75	7.30	7.45	7.40	7.76	6.73	7.34
Sp. Cond	µs/cm^C	364	389	609	669	473	447	468	456	489

MHBP-21D
15-25, Area B (vicinity)

		1/5/16	3/9/16	5/3/16	7/19/16	9/21/16	12/16/16	2/7/17	4/7/17	7/12/17	1/26/18
1,1,1-TCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	4 U	1 U
1,1-DCA	µg/L	0.41 J	1 U	0.2 U	1 U	1 U	1 U	1 U	320	120	130
1,1-DCE	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	120	29	37
1,2-DCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	8 U	1 U
acetone	µg/L	5 U	5 U	1 U	50 U	50 U	50 U	50 U	50 U	200 U	50 U
acetic acid	µg/L	NA	NA	NA	NA	NA	290 U	290 U	290 U	5,800 U	NA
ethanol	µg/L	NA	NA	NA	NA	NA	50 U	50 U	50 U	NA	NA
pH		7.43	7.49	7.52	7.24	7.44	7.06	7.45	5.85	6.46	6.49
Sp. Cond	µs/cm^C	832	826	968	984	702	920	888	1,392	997	1,210

OBG-7D
52-61.5, Area B (vicinity)

		1/6/16	3/8/16	5/3/16	7/20/16	9/23/16	12/16/16	2/6/17	4/10/17	7/12/17
1,1,1-TCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DCE	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
acetone	µg/L	1.5 J	5 U	1 U	50 U	50 U	50 U	50 U	50 U	50 U
acetic acid	µg/L	NA	NA	NA	NA	NA	290 U	290 U	290 U	5,800 U
ethanol	µg/L	NA	NA	NA	NA	NA	50 U	50 U	50 U	NA
pH		10.69	8.56	7.83	8.22	7.14	6.94	8.16	7.31	6.87
Sp. Cond	µs/cm^C	578.0	249	289.6	337	1,594	2,030	272.7	1,756	1,742

OBG-7S
5-10, Area B (vicinity)

		1/5/16	3/9/16	5/4/16	7/20/16	9/21/16	12/16/16	2/6/17	4/10/17	7/12/17
1,1,1-TCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DCE	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
acetone	µg/L	5 U	5 U	1 U	50 U	50 U	50 U	50 U	50 U	50 U
acetic acid	µg/L	NA	NA	NA	NA	NA	290 U	290 U	290 U	5,800 U
ethanol	µg/L	NA	NA	NA	NA	NA	50 U	50 U	50 U	NA
pH		5.65	7.44	6.91	6.70	7.11	7.75	6.69	8.16	7.11
Sp. Cond	µs/cm^C	410.0	173.0	276.7	351.0	230.3	365.5	401.3	4,173	431

OBG-7I
20-30, Area B (vicinity)

		1/6/16	3/8/16	5/3/16	7/20/16	9/23/16	12/16/16	2/6/17	4/10/17	7/12/17
1,1,1-TCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DCA	µg/L	0.76 J	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DCE	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
acetone	µg/L	5 U	5 U	1 U	50 U	50 U	50 U	50 U	50 U	50 U
acetic acid	µg/L	NA	NA	NA	NA	NA	5,800 U	290 U	290 U	5,800 U
ethanol	µg/L	NA	NA	NA	NA	NA	50 U	50 U	50 U	NA
pH		7.11	9.36	9.00	8.81	9.00	8.63	8.33	8.84	8.75
Sp. Cond	µs/cm^C	306.0	282	300.7	327	305.8	317.8	320.3	325	295

SOG C-6
8.5-53, Area C (no 7/16, 9/16, 12/16 or 2/17 data)

		1/6/16	3/8/16	5/3/16	4/5/17	7/14/17
1,1,1-TCA	µg/L	0.39 J	20 U	20 U	10 U	1 U
1,1-DCA	µg/L	374,000	41,300 D,EB1	10,000	53	2.9
1,1-DCE	µg/L	2.3	20 U	20 U	10 U	1 U
1,2-DCA	µg/L	370	770 EB1	670	18	2 U
acetone	µg/L	2.7 J	100 U	100 U	4,800	320
acetic acid	µg/L	NA	NA	NA	290 U	7,000 J
ethanol	µg/L	NA	NA	NA	11,000	500 U
pH		6.12	6.51	6.03	5.82	7.02
Sp. Cond	µs/cm^C	1,160	1,887	1,671	833	606

SOG E-6
8.5-33, Area B (no 12/16 data)

		1/6/16	3/8/16	5/3/16	7/19/16	9/23/16	2/8/17	4/7/17	7/13/17
1,1,1-TCA	µg/L	28,100	83,000 D,EB1	10,800	500 U	20 U	2 U	1 U	5 U
1,1-DCA	µg/L	306,000	251,200 D,EB1	188,000	49,000	1,400	8.8	3.4	5 U
1,1-DCE	µg/L	340	820 EB1	1,500	970	38	2 U	1 U	5 U
1,2-DCA	µg/L	25,100	20,800 D,EB1	20,600	5,600	290	2 U	1 U	10 U
acetone	µg/L	1,800	550	1,900	25,000 U	1,500	1,300	580	3,300
acetic acid	µg/L	NA	NA	NA	NA	NA	623,000	176,000	297,000
ethanol	µg/L	NA	NA	NA	NA	NA	2900	6,700	9,000
pH		5.14	6.23	5.83	6.29	6.65	7.13	6.78	6.40
Sp. Cond	µs/cm^C	5,212	3,623	3255	1,707	1,314	6,506	2,253	3,160

OBG-8S
6.1-10.1, Area A (vicinity)

		1/6/16	3/8/16	5/3/16	7/19/16	9/21/16	12/16/16	2/8/17	4/7/17	7/13/17
1,1,1-TCA	µg/L	1 U	1 U	0.2 U	4	1 U	1 U	1 U	1 U	1 U
1,1-DCA	µg/L	1 U	1 U	0.2 U	1	1 U	1 U	1 U	1 U	1 U
1,1-DCE	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DCA	µg/L	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	2 U
acetone	µg/L	5 U	5 U	1 U	50 U	50 U	50 U	50 U	50 U	50 U
acetic acid	µg/L	NA	NA	NA	NA	NA	290 U	290 U	290 U	5,800 U
ethanol	µg/L	NA	NA	NA	NA	NA	50 U	50 U	50 U	NA
pH		6.83	6.97	6.64	7.64	6.67	6.89	6.97	6.75	6.61
Sp. Cond	µs/cm^C	564	509	512	532	612	415.8	247.9	421.0	576

SOG A-2
8.5-23, Area A (no 9/16 or 2/17 data)

		1/6/16	3/8/16	5/3/16	7/19/16	12/16/16	4/5/17	7/13/17
1,1,1-TCA	µg/L	18 J	100 U	8 J	20 U	1 U	2 U	2 U
1,1-DCA	µg/L	31,700	65,900 D,EB2	1,300	930	38	82	58
1,1-DCE	µg/L	50 U	100 U	2 U	20 U	3	6	2 U
1,2-DCA	µg/L	6,300	11,300 EB2	430	130	8	7	7.5
acetone	µg/L	250 U	500 U	710	1000 U	790	260	210
acetic acid	µg/L	NA	NA	NA	NA	61,700	222,000	205,000
ethanol	µg/L	NA	NA	NA	NA	3,000	1,700	500 U
pH		6.40	7.13	6.82	6.26	6.87	6.56	6.49
Sp. Cond	µs/cm^C	7,605	4,628	1,524	3,837	1,543	4,046	2,663

SOG C-2
8.5-23, Area A (no 7/16 or 2/17 data)

		1/6/16	3/8/16	5/3/16	9/22/16	12/15/16	4/5/17	7/13/17
1,1,1-TCA	µg/L	300	100 U	1,600	10 U	5 U	1 U	1 U
1,1-DCA	µg/L	63,900	28,900 D,EB2	4,300	480	59	17	60
1,1-DCE	µg/L	29 J	100 U	53	19	8	3.4	2.7
1,2-DCA	µg/L	13,800	7,500 EB2	1,300	180	7.8	3	16
acetone	µg/L	580	500 U	50 U	500 U	250 U	50 U	64
acetic acid	µg/L	NA	NA	NA	NA	5,000	290 U	14,500 U
ethanol	µg/L	NA	NA	NA	NA	1,600	160	500 U
pH		7.04	7.04	6.43	6.63	6.43	6.65	6.85
Sp. Cond	µs/cm^C	3,421	4,841	7123	1,731	1,103	1,347	1,471

MHBP-13s
10-20, Area A

		1/6/16	3/8/16	5/1/16	7/18/16	9/23/16	12/16/16	2/7/17	4/6/17	7/13/17	1/26/18
1,1,1-TCA	µg/L	100 U	210	4 U	5 U	10 U	10 U	5 U	1 U	2 U	20 U
1,1-DCA	µg/L	100 U	150	14	170	29	28	8	8	12	29
1,1-DCE	µg/L	100 U	50 U	4 U	5 U	10 U	10 U	5 U	1 U	2 U	20 U
1,2-DCA	µg/L	100 U	50 U	6.8 J	11	10 U	10 U	5 U	2	4 U	20 U
acetone	µg/L	500 U	250 U	20 U	250 U	500 U	500 U	250 U	50 U	100 U	1,000 U
acetic acid	µg/L	NA	NA	NA	NA	NA	290 U	290 U	290 U	5,800 U	NA
ethanol	µg/L	NA	NA	NA	NA	NA	500 U	250 U	2,900	500 U	NA
pH		6.70	6.63	6.53	6.46	6.53	6.71	6.82	6.70	6.81	6.86
Sp. Cond	µs/cm^C	1,450	1,386	654	1,475	1,245	1,466	1,387	1,475	1,476	1,470

SOG G-8
8.5-53, Area C (no 7/16, 9/16, 12/16, 2/17, 4/17 data)

		1/6/16	3/8/16	5/3/16	7/14/17
1,1,1-TCA	µg/L	66,100	1,900	93,800	2.2
1,1-DCA	µg/L	106,800	6,100	79,200	2 U
1,1-DCE	µg/L	190	210	12,300	2.2
1,2-DCA	µg/L	2,300	200	5,200	4 U
acetone	µg/L	580	250 U	3500	740
acetic acid	µg/L	NA	NA	NA	274,000
ethanol	µg/L	NA	NA	NA	2,100
pH		6.65	6.52	5.51	6.71
Sp. Cond	µs/cm^C	3,474	1,589	3,727	3,015

SOG K-8
8.5-53, Area C (no 9/16, 12/16 or 2/17 data)

		1/6/16	3/8/16	5/3/16	7/19/16	4/6/17	7/14/17
1,1,1-TCA	µg/L	20,700	119,700 D,EB2	35,700 D	46,000	24	5 U
1,1-DCA	µg/L	80,600	78,700 D,EB2	56,100 D	37,000	76	210
1,1-DCE	µg/L	55.5	480 EB2	4,500	10,000	42	210
1,2-DCA	µg/L	5,500	6,600 EB2	5,100	3,200	15	12
acetone	µg/L	1,600	780	1100	25,000 U	3,300	2,600
acetic acid	µg/L	NA	NA	NA	NA	556,000	402,000
ethanol	µg/L	NA	NA	NA	NA	3,300	500 U
pH		5.95	6.26	6.31	6.85	6.40	6.24
Sp. Cond	µs/cm^C	3,358	2,666	2535	2,924	4,844	3,518

MHBP-11
10-20, Area C

		1/6/16	3/8/16	5/3/16	7/19/16	9/23/16	12/16/16	2/8/17	4/7/17	7/14/17	1/26/18
1,1,1-TCA	µg/L	429,300	438,300	37,400	500,000	20,000	1,000	500 U	10 U	1 U	1 U
1,1-DCA	µg/L	71,000	71,900	4,700	150,000	110,000	85,000	42,000	59	6.2	1.3
1,1-DCE	µg/L	1,200	1,600	20 U	27,000	32,000	13,000	3,800	10 U	8.3	1 U
1,2-DCA	µg/L	9,800	8,400	590	10,000 U	9,400	5,200	3,300	26	3.3	1 U
acetone	µg/L	1,300	1,300	100 U	500,000 U	50,000 U	50,000 U	25,000 U	9,200	1,700	250
acetic acid	µg/L	NA	NA	NA	NA	NA	48,700	47,900	92,300	329,000	NA
ethanol	µg/L	NA	NA	NA	NA	NA	50,000 U	5,000 U	5,300	2,200	NA
pH		6.37	6.37	7.29	7.91	6.12	6.18	6.14	7.07	6.61	7.11
Sp. Cond	µs/cm^C	2,586	2,586	423	2,212	2,200	1,969	2,032	1,760	3,338	1,960

SOG G-4
8.5-23, Area A (no 9/16, 12/16 or 2/17 data)

		1/6/16	3/8/16	5/3/16	7/19/16	4/6/17	7/14/17
1,1,1-TCA	µg/L	100 U	100 U	20 U	100 U	25 U	25 U
1,1-DCA	µg/L	22,200	63,200 D,EB1	22,200	11,000	2,700	1,600
1,1-DCE	µg/L	31 J	240 EB1	20 U	110	94	150
1,2-DCA	µg/L	2,800	11,500 EB1	5,700	2,300	820	82
acetone	µg/L	500 U	550	700	5,000 U	1,400	1,200 U
acetic acid	µg/L	NA	NA	NA	NA	109,000	14,500 U
ethanol	µg/L	NA	NA	NA	NA	18,000	500 U
pH		6.50	6.80	6.05	NA	6.16	6.55
Sp. Cond	µs/cm^C	3,148	3,210	1955	1,778	1,777	1,131

MHBP-12
10-20, Area A

		1/6/16	3/8/16	5/3/16	7/19/16	9/23/16	12/16/16	2/8/17	4/7/17	7/14/17	1/26/18
1,1,1-TCA	µg/L	4,700	4,900	2,600	2,500 U	1,000	1,000 U	400 U	20 U	2 U	4 U
1,1-DCA	µg/L	168,400	253,200	184,300	260,000	140,000	28,000	25,000	1,500	120	6.8
1,1-DCE	µg/L	260	260	330	2,500 U	1,500	1,000 U	480	52	190	4 U
1,2-DCA	µg/L	25,500	33,800	35,600	43,000	29,000	8,900	5,400	1,000	32	4 U
acetone	µg/L	1,600	2,400	2,300	120,000 U	50,000 U	50,000 U	20,000 U	7,000	1,600	3,700
acetic acid	µg/L	NA	NA	NA	NA	NA	226,000	266,000	302,000	168,000	NA
ethanol	µg/L	NA	NA	NA	NA	NA	50,000 U	5,000 U	2,800	5,000	NA
pH		6.39	6.31	6.05	6.23	6.12	6.08	6.03	5.97	6.50	7.18
Sp. Cond	µs/cm^C	2,994	3,435	3,132	4,130	3,452	3,348	3,504	3,339	2,059	2,170

LEGEND

- APPROXIMATE SITE BOUNDARY
- FENCE LINE
- BUILDING OUTLINE
- BOLLARD
- C.B. CATCH BASIN
- MHBP-XX MONITORING WELL LOCATION
- T-XX TMW/VMP LOCATION
- SOG-XX SURFACE OFF GAS WELL LOCATION
- TARGET ZONE (AOC)
  - TARGET ZONE A - 5-25 FEET BGS
  - TARGET ZONE B - 5-35 FEET BGS
  - TARGET ZONE C - 5-50 FEET BGS
- ELECTRICALLY HEATED ZONE
  - HEATED ZONE A - 10-20 FEET BGS
  - HEATED ZONE B - 10-30 FEET BGS
  - HEATED ZONE C - 10-50 FEET BGS

NOTES

1.

NYCRR Part 703.5 Groundwater Standards		
1,1,1-TCA	µg/L	5
1,1-DCA	µg/L	5
1,1-DCE	µg/L	5
1,2-DCA	µg/L	5
acetone	µg/L	50
acetic acid	µg/L	NL
ethanol	µg/L	NL
pH		NA
Sp. Cond	µs/cm^C	NA

2. START OF HEATING - 12/7/2015. VAPOR RECOVERY SYSTEM STARTUP - 1/28/2016.
3. COLOR CODING:
   BOLD - DETECTED RESULT
   BLUE - EXCEEDING GROUNDWATER CRITERIA
   PINK - NON-DETECT, NOT ANALYZED OR FIELD PARAMETER
4. AREA BETWEEN MHBP PROPERTY AND NY CENTRAL LINES, LLC PROPERTY CURRENTLY USED FOR SHOPPING PLAZA DELIVERIES.
5. ACCESS TO STAR GAS PRODUCTS INC., MID HUDSON BUSINESS PARK, AND NY CENTRAL LINES, LLC HAS BEEN OBTAINED BY THE DEPARTMENT.
6. ETHANOL RESULTS SHOWN ARE THE HIGHER OF THE DETECTED RESULTS, OR THE HIGHER OF THE METHOD DETECTION LIMITS FROM METHODS 8260 AND 8015M.

0 10 20 40
SCALE IN FEET

REVISIONS | NO | DATE | DRN | CHK

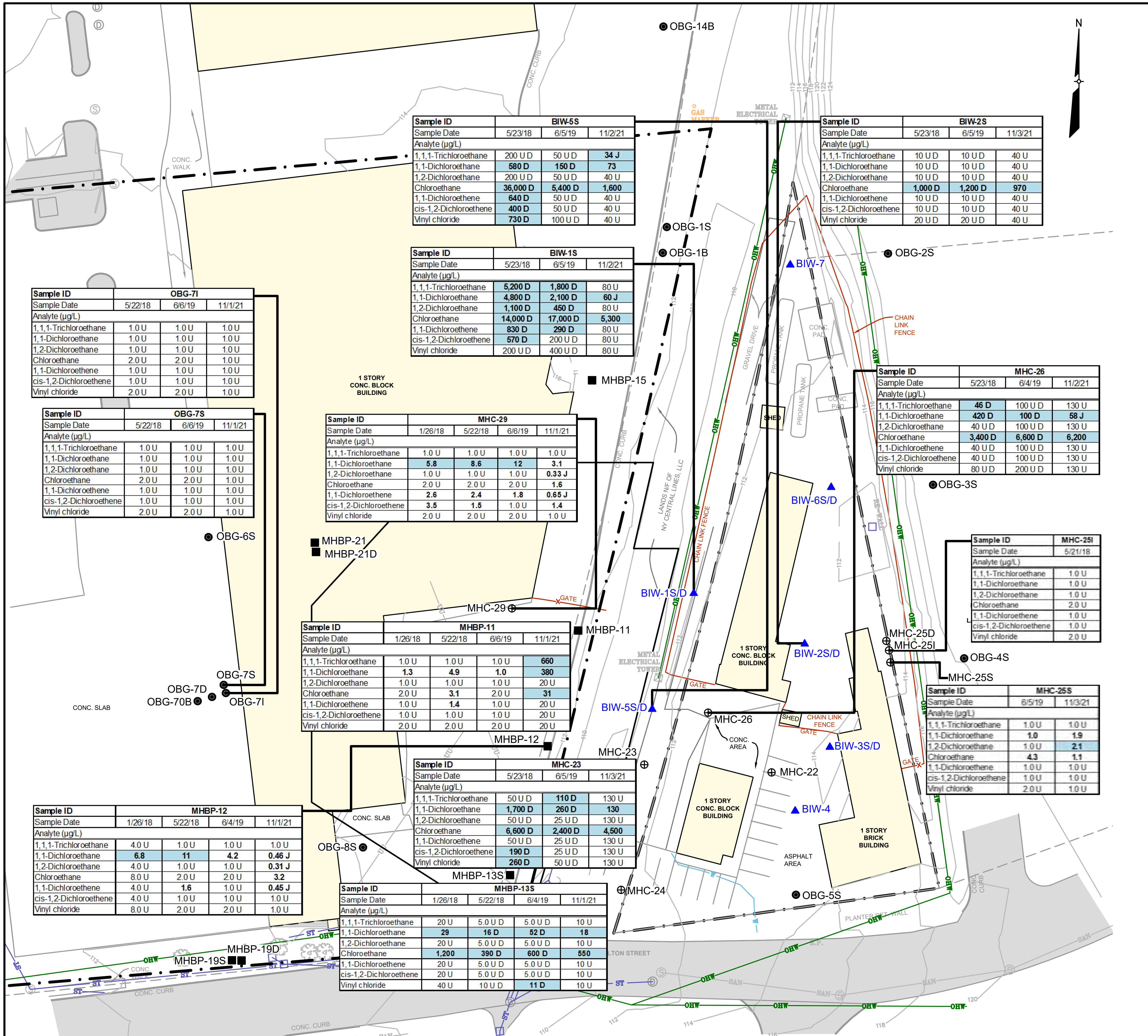
AECOM
40 British American Blvd.
Latham, New York 12110
T. (518) 951-2200
F. (518) 951-2300

DRN DES CHK APP

FORMER DUSO CHEMICAL SITE
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, NY, DUTCHESS COUNTY

GROUNDWATER ANALYTICAL RESULTS JANUARY 2016 TO JANUARY 2018

DATE: March 2022
PROJECT NO: 60647169
FILENAME: 60279080_070.dwg
SHEET NO: 1
DRAWING NO: **FIGURE 2-7**



LEGEND

BIW-1S/D ▲	BIOREMEDIATION INJECTION WELL LOCATION (2012)
OBG-2S ◉	O'BRIEN & GERE WELL LOCATION (2005 & 2007) (APPROXIMATE)
MHBP-11 ■	MID-HUDSON BUSINESS PARK WELL LOCATION (1993-1994, 2015)
MHC-30 ⊕	WELL LOCATION (1990s)
□	CATCH BASIN
Ⓓ	MANHOLES
	TREES
	BUILDING
	ROAD / PAVEMENT
112	TOPOGRAPHIC CONTOURS
	PROPERTY BOUNDARY
x	FENCE (APPROXIMATE)
	PARCEL BOUNDARY
OHW	OVERHEAD WIRES
W	UNDERGROUND WATER
SAN	SANITARY SEWER LINE
ST	STORMWATER LINE
UU	UNKNOWN UNDERGROUND UTILITIES
	MHBP TREATMENT AREA (APPROXIMATE IC BOUNDARIES)
	DUSO SITE BOUNDARY (APPROXIMATE IC BOUNDARIES)
VOCs	VOLATILE ORGANIC COMPOUNDS
µg/L	MICROGRAMS PER LITER
D	THE REPORTED VALUE IS FROM A SECONDARY DILUTION ANALYSIS FACTOR.
J	THE CONCENTRATION GIVEN IS AN APPROXIMATE VALUE.
U	THE COMPOUND WAS NOT DETECTED AT A CONCENTRATION GREATER THAN OR EQUAL TO THE MDL. MDL IS LISTED IN THIS CASE.

RESULTS IN **BOLD** WERE DETECTED AT A CONCENTRATION GREATER THAN OR EQUAL TO THE METHOD DETECTION LIMIT (MDL).

RESULTS IN **BOLD** AND SHADED IN BLUE WERE DETECTED AT A CONCENTRATION GREATER THAN NEW YORK STATE AMBIENT WATER QUALITY STANDARDS (AWQS) OR GUIDANCE VALUES (GV).

0 55 110
SCALE IN FEET

Sample ID	BIW-5S		
Sample Date	5/23/18	6/5/19	11/2/21
Analyte (µg/L)			
1,1,1-Trichloroethane	200 U D	50 U D	**34 J**
1,1-Dichloroethane	**580 D**	**150 D**	**73**
1,2-Dichloroethane	200 U D	50 U D	40 U
Chloroethane	**36,000 D**	**5,400 D**	**1,600**
1,1-Dichloroethene	**640 D**	50 U D	40 U
cis-1,2-Dichloroethene	**400 D**	50 U D	40 U
Vinyl chloride	**730 D**	100 U D	40 U

Sample ID	BIW-2S		
Sample Date	5/23/18	6/5/19	11/3/21
Analyte (µg/L)			
1,1,1-Trichloroethane	10 U D	10 U D	40 U
1,1-Dichloroethane	10 U D	10 U D	40 U
1,2-Dichloroethane	10 U D	10 U D	40 U
Chloroethane	**1,000 D**	**1,200 D**	**970**
1,1-Dichloroethene	10 U D	10 U D	40 U
cis-1,2-Dichloroethene	10 U D	10 U D	40 U
Vinyl chloride	20 U D	20 U D	40 U

Sample ID	BIW-1S		
Sample Date	5/23/18	6/5/19	11/2/21
Analyte (µg/L)			
1,1,1-Trichloroethane	**5,200 D**	**1,800 D**	80 U
1,1-Dichloroethane	**4,800 D**	**2,100 D**	**60 J**
1,2-Dichloroethane	**1,100 D**	**450 D**	80 U
Chloroethane	**14,000 D**	**17,000 D**	**5,300**
1,1-Dichloroethene	**830 D**	**290 D**	80 U
cis-1,2-Dichloroethene	**570 D**	200 U D	80 U
Vinyl chloride	200 U D	400 U D	80 U

Sample ID	OBG-7I		
Sample Date	5/22/18	6/6/19	11/1/21
Analyte (µg/L)			
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U
Chloroethane	2.0 U	2.0 U	1.0 U
1,1-Dichloroethene	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	1.0 U	1.0 U	1.0 U
Vinyl chloride	2.0 U	2.0 U	1.0 U

Sample ID	MHC-26		
Sample Date	5/23/18	6/4/19	11/2/21
Analyte (µg/L)			
1,1,1-Trichloroethane	**46 D**	100 U D	130 U
1,1-Dichloroethane	**420 D**	**100 D**	**58 J**
1,2-Dichloroethane	40 U D	100 U D	130 U
Chloroethane	**3,400 D**	**6,600 D**	**6,200**
1,1-Dichloroethene	40 U D	100 U D	130 U
cis-1,2-Dichloroethene	40 U D	100 U D	130 U
Vinyl chloride	80 U D	200 U D	130 U

Sample ID	OBG-7S		
Sample Date	5/22/18	6/6/19	11/1/21
Analyte (µg/L)			
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U
Chloroethane	2.0 U	2.0 U	1.0 U
1,1-Dichloroethene	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	1.0 U	1.0 U	1.0 U
Vinyl chloride	2.0 U	2.0 U	1.0 U

Sample ID	MHC-29			
Sample Date	1/26/18	5/22/18	6/6/19	11/1/21
Analyte (µg/L)				
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	**5.8**	**8.6**	**12**	**3.1**
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U	**0.33 J**
Chloroethane	2.0 U	2.0 U	2.0 U	**1.6**
1,1-Dichloroethene	**2.6**	**2.4**	**1.8**	**0.65 J**
cis-1,2-Dichloroethene	**3.5**	**1.5**	1.0 U	**1.4**
Vinyl chloride	2.0 U	2.0 U	2.0 U	1.0 U

Sample ID	MHC-25I
Sample Date	5/21/18
Analyte (µg/L)	
1,1,1-Trichloroethane	1.0 U
1,1-Dichloroethane	1.0 U
1,2-Dichloroethane	1.0 U
Chloroethane	2.0 U
1,1-Dichloroethene	1.0 U
cis-1,2-Dichloroethene	1.0 U
Vinyl chloride	2.0 U

Sample ID	MHBP-11			
Sample Date	1/26/18	5/22/18	6/6/19	11/1/21
Analyte (µg/L)				
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U	**660**
1,1-Dichloroethane	**1.3**	**4.9**	**1.0**	**380**
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U	20 U
Chloroethane	2.0 U	**3.1**	2.0 U	**31**
1,1-Dichloroethene	1.0 U	**1.4**	1.0 U	20 U
cis-1,2-Dichloroethene	1.0 U	1.0 U	1.0 U	20 U
Vinyl chloride	2.0 U	2.0 U	2.0 U	20 U

Sample ID	MHC-25S	
Sample Date	6/5/19	11/3/21
Analyte (µg/L)		
1,1,1-Trichloroethane	1.0 U	1.0 U
1,1-Dichloroethane	**1.0**	**1.9**
1,2-Dichloroethane	1.0 U	**2.1**
Chloroethane	**4.3**	**1.1**
1,1-Dichloroethene	1.0 U	1.0 U
cis-1,2-Dichloroethene	1.0 U	1.0 U
Vinyl chloride	2.0 U	1.0 U

Sample ID	MHC-23		
Sample Date	5/23/18	6/5/19	11/3/21
Analyte (µg/L)			
1,1,1-Trichloroethane	50 U D	**110 D**	130 U
1,1-Dichloroethane	**1,700 D**	**260 D**	**130**
1,2-Dichloroethane	50 U D	25 U D	130 U
Chloroethane	**6,600 D**	**2,400 D**	**4,500**
1,1-Dichloroethene	50 U D	25 U D	130 U
cis-1,2-Dichloroethene	**190 D**	25 U D	130 U
Vinyl chloride	**260 D**	50 U D	130 U

Sample ID	MHBP-12			
Sample Date	1/26/18	5/22/18	6/4/19	11/1/21
Analyte (µg/L)				
1,1,1-Trichloroethane	4.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	**6.8**	**11**	**4.2**	**0.46 J**
1,2-Dichloroethane	4.0 U	1.0 U	1.0 U	**0.31 J**
Chloroethane	8.0 U	2.0 U	2.0 U	**3.2**
1,1-Dichloroethene	4.0 U	**1.6**	1.0 U	**0.45 J**
cis-1,2-Dichloroethene	4.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	8.0 U	2.0 U	2.0 U	1.0 U

Sample ID	MHBP-13S			
Sample Date	1/26/18	5/22/18	6/4/19	11/1/21
Analyte (µg/L)				
1,1,1-Trichloroethane	20 U	5.0 U D	5.0 U D	10 U
1,1-Dichloroethane	**29**	**16 D**	**52 D**	**18**
1,2-Dichloroethane	20 U	5.0 U D	5.0 U D	10 U
Chloroethane	**1,200**	**390 D**	**600 D**	**550**
1,1-Dichloroethene	20 U	5.0 U D	5.0 U D	10 U
cis-1,2-Dichloroethene	20 U	5.0 U D	5.0 U D	10 U
Vinyl chloride	40 U	10 U D	**11 D**	10 U

SOURCE: - *BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.*
- *MHBP AND MHC WELL LOCATIONS FROM COORDINATES IN GROUNDWATER SAMPLING FIELD SHEET SUMMARY SPREADSHEET, PROVIDED BY CHAZEN.*

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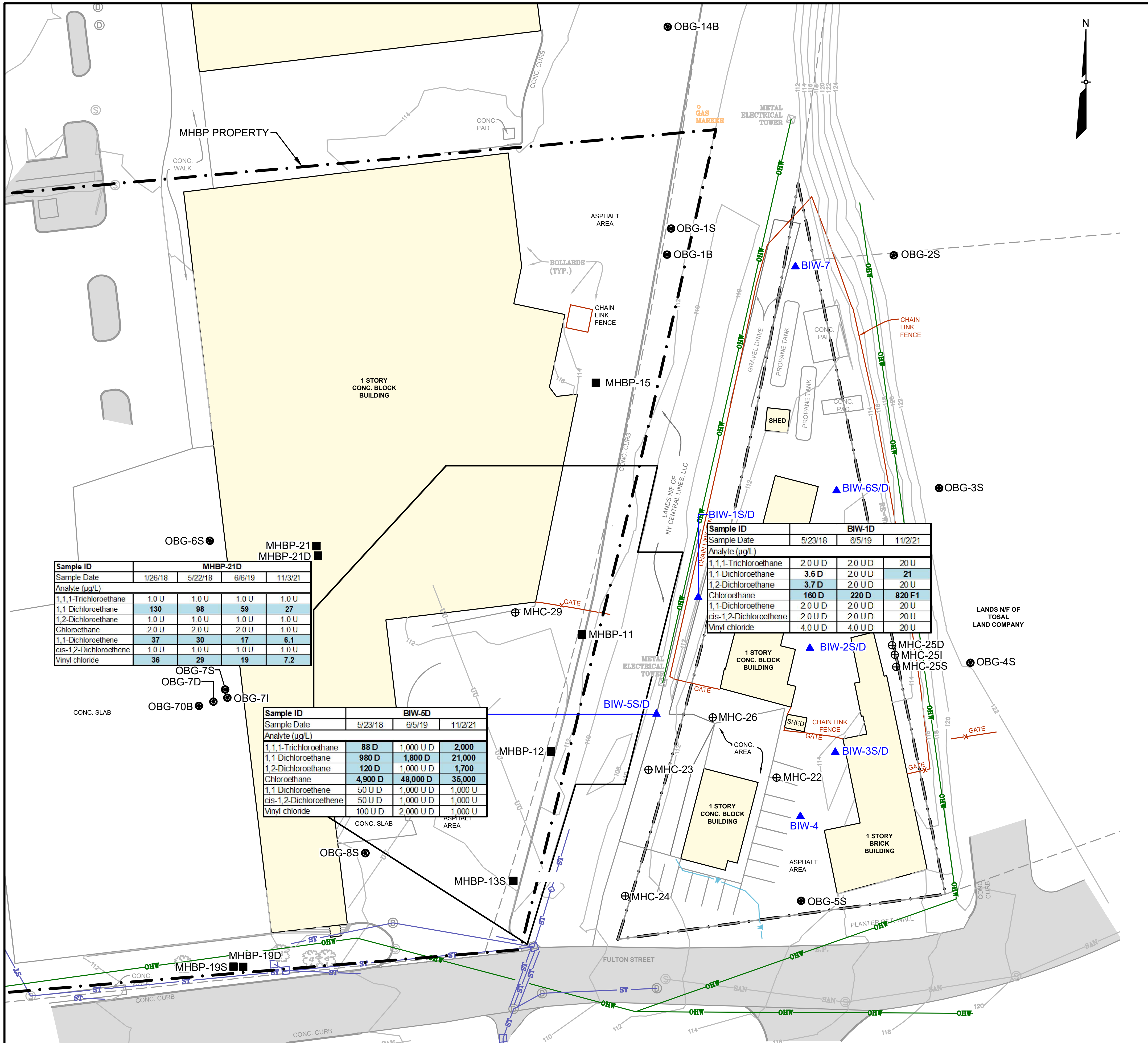
FIGURE 2-8
SITE-RELATED VOCs IN GROUNDWATER
SHALLOW MONITORING WELLS
2018-2021

FORMER DUSO CHEMICAL FACILITY
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2022 60647169



Sample ID	MHBP-21D			
Sample Date	1/26/18	5/22/18	6/6/19	11/3/21
Analyte (µg/L)				
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	**130**	**98**	**59**	**27**
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	2.0 U	2.0 U	2.0 U	1.0 U
1,1-Dichloroethene	**37**	**30**	**17**	**6.1**
cis-1,2-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	**36**	**29**	**19**	**7.2**

Sample ID	BIW-1D		
Sample Date	5/23/18	6/5/19	11/2/21
Analyte (µg/L)			
1,1,1-Trichloroethane	2.0 U D	2.0 U D	20 U
1,1-Dichloroethane	**3.6 D**	2.0 U D	**21**
1,2-Dichloroethane	**3.7 D**	2.0 U D	20 U
Chloroethane	**160 D**	**220 D**	**820 F1**
1,1-Dichloroethene	2.0 U D	2.0 U D	20 U
cis-1,2-Dichloroethene	2.0 U D	2.0 U D	20 U
Vinyl chloride	4.0 U D	4.0 U D	20 U

Sample ID	BIW-5D		
Sample Date	5/23/18	6/5/19	11/2/21
Analyte (µg/L)			
1,1,1-Trichloroethane	**88 D**	1,000 U D	**2,000**
1,1-Dichloroethane	**980 D**	**1,800 D**	**21,000**
1,2-Dichloroethane	**120 D**	1,000 U D	**1,700**
Chloroethane	**4,900 D**	**48,000 D**	**35,000**
1,1-Dichloroethene	50 U D	1,000 U D	1,000 U
cis-1,2-Dichloroethene	50 U D	1,000 U D	1,000 U
Vinyl chloride	100 U D	2,000 U D	1,000 U

LEGEND

- BIW-1S/D ▲ BIOREMEDIATION INJECTION WELL LOCATION (2012)
- OBG-2S ● O'BRIEN & GERE WELL LOCATION (2005 & 2007) (APPROXIMATE)
- MHBP-11 ■ MID-HUDSON BUSINESS PARK WELL LOCATION (1993-1994, 2015)
- MHC-30 ⊕ WELL LOCATION (1990s)
- CATCH BASIN
- MANHOLES
- TREES
- BUILDING
- ROAD / PAVEMENT
- TOPOGRAPHIC CONTOURS
- PROPERTY BOUNDARY
- FENCE (APPROXIMATE)
- PARCEL BOUNDARY
- OVERHEAD WIRES
- UNDERGROUND WATER
- SANITARY SEWER LINE
- STORMWATER LINE
- UNKNOWN UNDERGROUND UTILITIES
- MHBP TREATMENT AREA (APPROXIMATE IC BOUNDARIES)
- DUSO SITE BOUNDARY (APPROXIMATE IC BOUNDARIES)
- VOCs VOLATILE ORGANIC COMPOUNDS
- µg/L MICROGRAMS PER LITER
- D THE REPORTED VALUE IS FROM A SECONDARY DILUTION ANALYSIS FACTOR.
- J THE CONCENTRATION GIVEN IS AN APPROXIMATE VALUE.
- U THE COMPOUND WAS NOT DETECTED AT A CONCENTRATION GREATER THAN OR EQUAL TO THE MDL. MDL IS LISTED IN THIS CASE.

RESULTS IN **BOLD** WERE DETECTED AT A CONCENTRATION GREATER THAN OR EQUAL TO THE METHOD DETECTION LIMIT (MDL).

RESULTS IN **BOLD** AND SHADED IN BLUE WERE DETECTED AT A CONCENTRATION GREATER THAN NEW YORK STATE AMBIENT WATER QUALITY STANDARDS (AWQS) OR GUIDANCE VALUES (GV).

0 55 110

SCALE IN FEET

SOURCE: - BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.
- MHBP AND MHC WELL LOCATIONS FROM COORDINATES IN GROUNDWATER SAMPLING FIELD SHEET SUMMARY SPREADSHEET, PROVIDED BY CHAZEN.

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FIGURE 2-9
SITE-RELATED VOCs IN GROUNDWATER DEEP MONITORING WELLS 2018-2021

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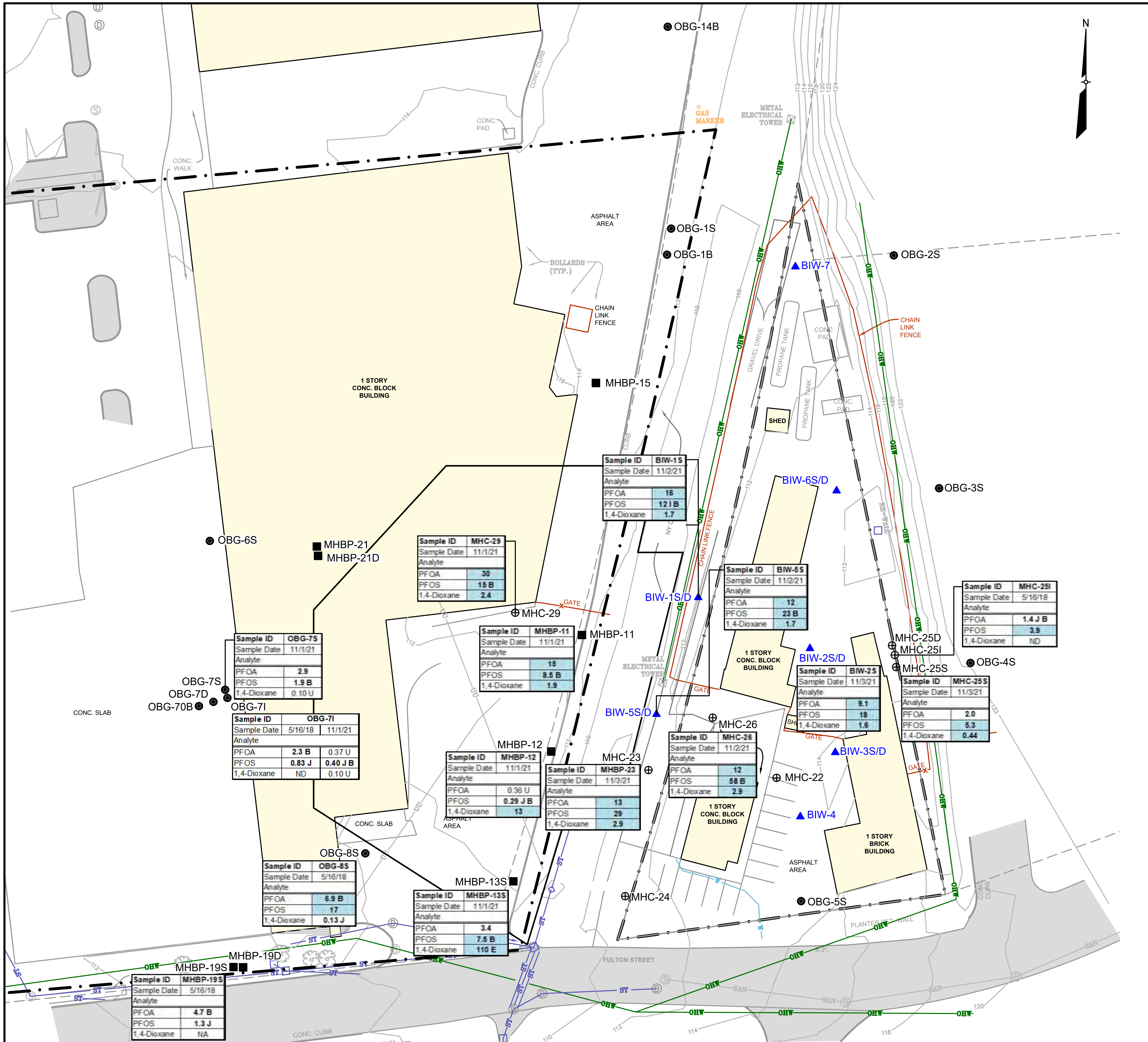

LEGEND

BIW-1S/D ▲	BIOREMEDIATION INJECTION WELL LOCATION (2012)
OBG-2S ●	O'BRIEN & GERE WELL LOCATION (2005 & 2007) (APPROXIMATE)
MHBP-11 ■	MID-HUDSON BUSINESS PARK WELL LOCATION (1993-1994, 2015)
MHC-30 ⊕	WELL LOCATION (1990s)
	CATCH BASIN
	MANHOLES
	TREES
	BUILDING
	ROAD / PAVEMENT
	TOPOGRAPHIC CONTOURS
	PROPERTY BOUNDARY
	FENCE (APPROXIMATE)
	PARCEL BOUNDARY
	OVERHEAD WIRES
	UNDERGROUND WATER
	SANITARY SEWER LINE
	STORMWATER LINE
	UNKNOWN UNDERGROUND UTILITIES
	MHBP TREATMENT AREA (APPROXIMATE IC BOUNDARIES)
	DUSO SITE BOUNDARY (APPROXIMATE IC BOUNDARIES)
PFOA	PERFLUOROOCTANOIC ACID
PFOS	PERFLUOROOCTANESULFONIC ACID
µg/L	1,4-DIOXANE IS REPORTED IN MICROGRAMS PER LITER
ng/L	PFOA AND PFOS ARE REPORTED IN NANOGRAMS PER LITER
B	COMPOUND WAS FOUND IN THE BLANK AND SAMPLE
E	RESULT EXCEEDED CALIBRATION RANGE
J	RESULT IS LESS THAN THE RL BUT GREATER THAN OR EQUAL TO THE MDL AND THE CONCENTRATION IS AN APPROXIMATE VALUE
U	THE COMPOUND WAS NOT DETECTED AT A CONCENTRATION GREATER THAN OR EQUAL TO THE MDL. MDL IS LISTED IN THIS CASE.
ND	NOT DETECTED

RESULTS IN **BOLD** WERE DETECTED AT A CONCENTRATION GREATER THAN OR EQUAL TO THE METHOD DETECTION LIMIT (MDL).

RESULTS IN **BOLD** AND SHADED IN BLUE WERE DETECTED AT A CONCENTRATION GREATER THAN NEW YORK STATE AMBIENT WATER QUALITY STANDARDS (AWQS) OR GUIDANCE VALUES (GV).

0 55 110

SCALE IN FEET

SOURCE: - *BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.*
- *MHBP AND MHC WELL LOCATIONS FROM COORDINATES IN GROUNDWATER SAMPLING FIELD SHEET SUMMARY SPREADSHEET, PROVIDED BY CHAZEN.*

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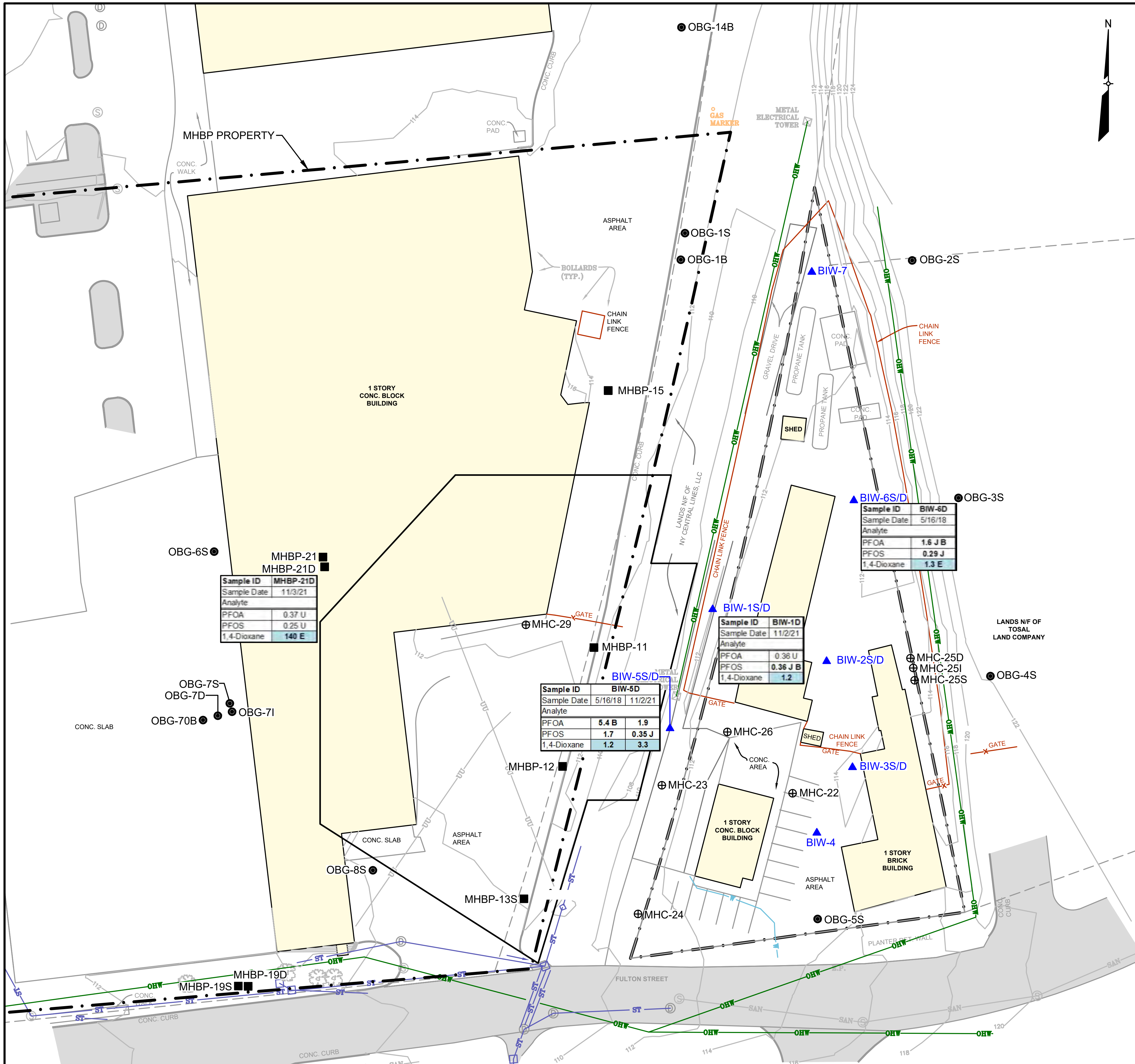
FIGURE 2-10
EMERGING CONTAMINANTS
IN GROUNDWATER
SHALLOW MONITORING WELLS - 2018-2021

FORMER DUSO CHEMICAL FACILITY
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2022 60647169



Sample ID	MHBP-21D
Sample Date	11/3/21
Analyte	
PFOA	0.37 U
PFOS	0.25 U
1,4-Dioxane	**140 E**

Sample ID	BIW-6D
Sample Date	5/16/18
Analyte	
PFOA	**1.6 J B**
PFOS	**0.29 J**
1,4-Dioxane	**1.3 E**

Sample ID	BIW-1D
Sample Date	11/2/21
Analyte	
PFOA	0.36 U
PFOS	**0.36 J B**
1,4-Dioxane	**1.2**

Sample ID	BIW-5D	
Sample Date	5/16/18	11/2/21
Analyte		
PFOA	**5.4 B**	**1.9**
PFOS	**1.7**	**0.35 J**
1,4-Dioxane	**1.2**	**3.3**

LEGEND

- BIW-1S/D ▲ BIOREMEDIATION INJECTION WELL LOCATION (2012)
- OBG-2S ● O'BRIEN & GERE WELL LOCATION (2005 & 2007) (APPROXIMATE)
- MHBP-11 ■ MID-HUDSON BUSINESS PARK WELL LOCATION (1993-1994, 2015)
- MHC-30 ⊕ WELL LOCATION (1990s)
- CATCH BASIN
- MANHOLES
- TREES
- BUILDING
- ROAD / PAVEMENT
- TOPOGRAPHIC CONTOURS
- PROPERTY BOUNDARY
- FENCE (APPROXIMATE)
- PARCEL BOUNDARY
- OVERHEAD WIRES
- UNDERGROUND WATER
- SANITARY SEWER LINE
- STORMWATER LINE
- UNKNOWN UNDERGROUND UTILITIES
- MHBP TREATMENT AREA (APPROXIMATE IC BOUNDARIES)
- DUSO SITE BOUNDARY (APPROXIMATE IC BOUNDARIES)
- PFOA PERFLUOROOCTANOIC ACID
- PFOS PERFLUOROOCTANESULFONIC ACID
- µg/L 1,4-DIOXANE IS REPORTED IN MICROGRAMS PER LITER
- ng/L PFOA AND PFOS ARE REPORTED IN NANOGRAMS PER LITER
- B COMPOUND WAS FOUND IN THE BLANK AND SAMPLE
- E RESULT EXCEEDED CALIBRATION RANGE
- J RESULT IS LESS THAN THE RL BUT GREATER THAN OR EQUAL TO THE MDL AND THE CONCENTRATION IS AN APPROXIMATE VALUE
- U THE COMPOUND WAS NOT DETECTED AT A CONCENTRATION GREATER THAN OR EQUAL TO THE MDL. MDL IS LISTED IN THIS CASE.

RESULTS IN **BOLD** WERE DETECTED AT A CONCENTRATION GREATER THAN OR EQUAL TO THE METHOD DETECTION LIMIT (MDL).

RESULTS IN **BOLD** AND SHADED IN BLUE WERE DETECTED AT A CONCENTRATION GREATER THAN NEW YORK STATE AMBIENT WATER QUALITY STANDARDS (AWQS) OR GUIDANCE VALUES (GV).

0 55 110
SCALE IN FEET

SOURCE: - BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.
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FIGURE 2-11
EMERGING CONTAMINANTS
IN GROUNDWATER
DEEP MONITORING WELLS - 2018-2021

FORMER DUSO CHEMICAL FACILITY
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2022 60647169

TABLES

Table 2-1
Groundwater Elevations
MHBP Treatment Area and Duso Site
Poughkeepsie, New York
January 2018 - November 2021

Well ID	Ground Elevation* (ft amsl)	Top of Casing Elevation* (ft amsl)	January 26, 2018		May 23, 2018		June 4, 2019		November 1, 2021	
			Depth to Water (ft)	GW Elev. (ft amsl)	Depth to Water (ft)	GW Elev. (ft amsl)	Depth to Water (ft)	GW Elev. (ft amsl)	Depth to Water (ft)	GW Elev. (ft amsl)
BIW-1S	112.40	111.99	NM	NA	4.20	107.79	3.65	108.34	3.63	108.36
BIW-1D	112.40	111.68	NM	NA	4.40	107.28	3.50	108.18	3.00	108.68
BIW-2S	112.44	111.01	NM	NA	3.75	107.26	3.40	107.61	2.37	108.64
BIW-2D	112.44	111.03	NM	NA	NM	NA	NM	NA	NM	NA
BIW-3S	112.28	111.95	NM	NA	NM	NA	NM	NA	NM	NA
BIW-3D	112.28	111.93	NM	NA	NM	NA	NM	NA	NM	NA
BIW-4	112.07	112.54	NM	NA	NM	NA	NM	NA	NM	NA
BIW-5S	111.57	111.19	NM	NA	3.90	107.29	3.40	107.79	3.13	108.06
BIW-5D	111.57	110.93	NM	NA	3.70	107.23	3.50	107.43	3.35	107.58
BIW-6S	112.36	111.93	NM	NA	NM	NA	NM	NA	NM	NA
BIW-6D	112.36	111.92	NM	NA	NM	NA	NM	NA	NM	NA
BIW-7	111.63	111.21	NM	NA	NM	NA	NM	NA	NM	NA
MHBP-11	112.12	111.58	4.40	107.18	4.40	107.18	4.20	107.38	3.48	108.10
MHBP-12	111.76	111.35	4.50	106.85	4.50	106.85	4.40	106.95	3.90	107.45
MHBP-13S	110.38	109.63	3.50	106.13	3.50	106.13	3.70	105.93	3.00	106.63
MHBP-19S	NM	111.72	NM	NA	NM	NA	NM	NA	NM	NA
MHBP-19D	NM	111.58	NM	NA	NM	NA	NM	NA	NM	NA
MHBP-21	112.81	112.43	NM	NA	NM	NA	NM	NA	NM	NA
MHBP-21D	112.85	112.60	5.50	107.10	5.20	107.40	4.95	107.65	4.79	107.81
MHC-22	NM	113.03	NM	NA	NM	NA	NM	NA	NM	NA
MHC-23	NM	112.26	NM	NA	3.40	108.86	4.20	108.06	3.73	108.53
MHC-24	NM	111.58	NM	NA	NM	NA	NM	NA	NM	NA
MHC-25D	NM	113.23	NM	NA	NM	NA	NM	NA	NM	NA
MHC-25I	NM	113.51	NM	NA	1.50	NA	NM	NA	NM	NA
MHC-25S	NM	113.47	NM	NA	NM	NA	2.40	111.07	1.46	112.01
MHC-26	NM	112.37	NM	NA	2.60	109.77	3.45	108.92	3.71	108.66
MHC-29	112.40	111.07	4.60	106.47	4.40	106.67	4.50	106.57	3.10	107.97
OBG-1B	NM	114.56	NM	NA	NM	NA	NM	NA	NM	NA
OBG-1S	NM	115.39	NM	NA	NM	NA	NM	NA	NM	NA
OBG-6S	NM	112.89	NM	NA	NM	NA	NM	NA	NM	NA
OBG-7S	112.81	112.67	NM	NA	4.40	108.27	4.85	107.82	4.19	108.48
OBG-7I	112.85	112.69	NM	NA	5.40	107.29	5.40	107.29	4.89	107.80
OBG-7D	112.80	112.64	NM	NA	NM	NA	NM	NA	NM	NA
OBG-70B	NM	112.81	NM	NA	NM	NA	NM	NA	NM	NA
OBG-8S	109.87	109.79	NM	NA	NM	NA	NM	NA	NM	NA

Notes:
* Ground Elevations and Measuring Point Elevations were collected during various phases between 2005 and 2017 and are presumed to be accurate.
ft - Feet
amsl - Above Mean Sea Level
GW - Groundwater
NM - Not Measured
NA - Not Available

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-8		MHBP-8		MHBP-8		MHBP-8 (2)		MHBP-10		MHBP-10		MHBP-10		MHBP-10		MHBP-11		MHBP-11		MHBP-11	
	Date		August 1995 (1)		9/7/2005		1/13/2006		2/24/2011		August 1995 (1)		9/8/2005		1/12/2006		12/11/2012		August 1995 (1)		9/8/2005		1/12/2006	
	Screen Interval (ft bgs)		5-15		5-15		5-15		5-15		5-15		5-15		5-15		5-15		10-20		10-20		10-20	
	Area		Area A		Area A		Area A		Area A		Area C		Area C		Area C		Area C		Area C		Area C		Area C	
CAS No.	*VOC (µg/l)*																							
71-55-6	1,1,1-Trichloroethane	5	10,000	U	1,250	U	5,000	U	**420**		**95,000**		**144,000**		**48,000**		**44,000**	D	**190,000**		**138,000**		**449,000**	
79-34-5	1,1,2,2-Tetrachloroethane	5			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
79-00-5	1,1,2-Trichloroethane	1			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
75-34-3	1,1-Dichloroethane	5	**220,000**		**199,000**		**232,000**		**68,000**	D	**14,000**		**17,800**		**7,760**		**17,000**	D	**53,000**		**23400**		**77,000**	
75-35-4	1,1-Dichloroethene	5	10,000	U	1,250	U	5,000	U	**85**	J	2,500	U	**480**	J	1,000	U	**7,800**	D	5,000	U	**450**	J	**1,050**	J
87-61-6	1,2,3-Trichlorobenzene	5																						
120-82-1	1,2,4-Trichlorobenzene	5			2,500	U	10,000	U	100	U			2,000	U	2,000	U	800	U			2,500	U	5,000	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04			2,500	U	10,000	U	100	U			2,000	U	2,000	U	800	U			2,500	U	5,000	U
106-93-4	1,2-Dibromoethane	NS			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
95-50-1	1,2-Dichlorobenzene	3			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
107-06-2	1,2-Dichloroethane	0.6	**4,600**		**37,000**		**35,900**		**6,100**		2,500	U	**1,120**		**400**	J	**760**	DJ	**3,900**	J	**2,750**		**7,950**	
78-87-5	1,2-Dichloropropane	1			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
541-73-1	1,3-Dichlorobenzene	3							100	U							800	U						
142-28-9	1,3-Dichloropropane	5																						
106-46-7	1,4-Dichlorobenzene	3			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
123-91-1	1,4-Dioxane	0.35																					2,500	U
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)			25,000	U	100,000	U	1,000	U			20,000	U	20,000	U	8,000	U			25,000	U	50,000	U
591-78-6	2-Hexanone (methyl n-butyl ketone)	50			12,500	U	50,000	U	500	U			10,000	U	10,000	U	4,000	U			12,500	U	25,000	U
108-10-1	4-Methyl-2-pentanone	NS			12,500	U	50,000	U	500	U			10,000	U	10,000	U	4,000	U			12,500	U	25,000	U
67-64-1	Acetone	50 (GV)			25,000	U	100,000	U	1,000	U			20,000	U	20,000	U	8,000	U			25,000	U	50,000	U
71-43-2	Benzene	1			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
74-97-5	Bromochloromethane	5																						
75-27-4	Bromodichloromethane	50(GV)			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
75-25-2	Bromoform	50(GV)							100	U							800	U						
74-83-9	Bromomethane	5			2,500	U	10,000	U	100	U			1,000	U	1,000	U	800	U			2,500	U	5,000	U
75-15-0	Carbon Disulfide	NS			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
56-23-5	Carbon Tetrachloride	5			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
108-90-7	Chlorobenzene	5			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
75-00-3	Chloroethane	5			**13,700**		**15,000**		**20,000**	D			1,000	U	1,000	U	800	U			2,500	U	5,000	U
67-66-3	Chloroform	7			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
74-87-3	Chloromethane	5			2,500	U	10,000	U	100	U			2,000	U	2,000	U	800	U			2,500.0	U	5,000	U
156-59-2	cis-1,2-Dichloroethene (3)	5	10,000	U	1,250	U	5,000	U	100	U		U	1,000	U	1,000	U	800	U	5,000	U	1,250	U	2,500	U
10061-01-5	cis-1,3-Dichloropropene	0.4			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
10061-02-6	trans-1,3-Dichloropropene				1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
110-82-7	Cyclohexane	NS			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
124-48-1	Dibromochloromethane	50(GV)			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5			2,500	U	5,000	U	100	U			1,000	U	1,000	U	800	U			2,500	U	5,000	U
75-09-2	Dichloromethane	5			**1,120**	J	20,000	U					4,000	UJ	4,000	U					5,000	U	2,500	U
64-17-5	Ethanol (ug/L)	NS																						
100-41-4	Ethyl Benzene	5			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
98-82-8	Isopropylbenzene	5			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
79-20-9	Methyl Acetate	NS			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
1634-04-4	Methyl tert-butyl ether	10(GV)			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
108-88-3	Methylbenzene	5			1,250	U	5,000	U					1,000	U	1,000	U					1,250	U	2,500	U
108-87-2	Methylcyclohexane	50			1,250	U	5,000	U	100	U			1,000	U	1,000	U	800	U			1,250	U	2,500	U
75-09-2	Methylene chloride	5							**110**								800	U						
179601-23-1	m/p-Xylenes	5			2,500	U	10,000	U	200	U			2,000	U	2,000	U	1,600	U			2,500	U	5,000	U
95-47-6	o-Xylenes	5			2,500	U	10,000	U	200	U			2,000	U	2,000	U	1,600	U			2,500	U	5,000	U
100-42-5	Styrene	5							100	U							800	U					2,500	U
127-18-4	Tetrachloroethene	5	10,000	U	1,250	U	5,000	U	100	U	2,500	U	1,000	U	1,000	U	800	U	5,000	U	1,250	U	2,500	U
108-88-3	Toluene	5							100	U							800	U						
156-60-5	trans-1,2-Dichloroethene (3)	5	10,000	U	1,250	U	5,000	U	100	U	2,500	U	1,000	U	1,000	U	800	U	5,000	U	1,250	U	2,500	U
79-01-6	Trichloroethene	5	10,000	U	1,250	U	5,000	U	100	U	2,500	U	1,000	U	1,000	U	800	U	5,000	U	1,250	U	2,500	U
75-69-4	Trichlorofluoromethane (CFC-11)	5			2,500	U	5,000	U	100	U			1,000	U	1,000	U	800	U			2,500	U	5,000	U
75-01-4	Vinyl chloride	2	20,000	U	2,500	U	10,000	U	**290**		5,000	U	2,000	U	2,000	U	800	U	10,000	U	2,500	U	5,000	U
	Total detected CVOCs	NS	**224,600**		**250,820**		**282,900**		**95,005**		**109,000**		**167,400**		**56,160**		**69,560**		**246,900**		**164,600**		**535,000**	
	Total detected VOCs	NS	**224,600**		**250,820**		**282,900**		**95,005**		**109,000**		**167,400**		**56,160**		**69,560**		**246,900**		**164,600**		**535,000**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-11 (2)		MHBP-11		MHBP-11		MHBP-11		MHBP-11		MHBP-11		MHBP-11		MHBP-11		MHBP-11		MHBP-11	
	Date		2/24/2011		6/18/2015 (5)		1/6/2016		3/8/2016		5/3/2016		7/19/2016		9/23/2016		12/16/2016		2/8/2017		4/7/2017	
	Screen Interval (ft bgs)		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20	
	Area		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C	
CAS No.	*VOC (µg/l)*																					
71-55-6	**1,1,1-Trichloroethane**	5	**920,000**	**D**	**4,100**		**429,300**	**D**	**438,300**	**D**	**37,400**	**D**	**500,000**		**20,000**		1000	U	500	U	10	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	100	U	50	U	50	U	100	U	20	U	5,000	U	500	U	500	U	250	U	5	U
79-00-5	**1,1,2-Trichloroethane**	1	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1000	U	500	U	10	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	**400**		50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
75-34-3	**1,1-Dichloroethane**	5	**120,000**	**D**	**660**		**71,000**	**D**	**71,900**	**D**	**4,700**	**D**	**150,000**		**110,000**		**85,000**		**42,000**		**59**	
75-35-4	**1,1-Dichloroethene**	5	**51,000**	**D**	**28**	**J**	**1,200**	**D**	**1,600**	**D**	20	U	**27,000**		**32,000**		**13,000**		**3,800**		10	U
87-61-6	**1,2,3-Trichlorobenzene**	5			50	U	50	U	100	U	20	U	50,000	U	5,000	U	5,000	U (V-05)	2,500	U	50	U
120-82-1	**1,2,4-Trichlorobenzene**	5	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	20	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	100	U	50	U	50	U	100	U	20	U	50,000	U	5,000	U	5,000	U	2,500	U	50	U
106-93-4	**1,2-Dibromoethane**	NS	100	U	50	U	50	U	100	U	20	U	5,000	U	500	U	500	U	250	U	5	U
95-50-1	**1,2-Dichlorobenzene**	3	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
107-06-2	**1,2-Dichloroethane**	0.6	**13,000**	**DJ**	**76**		**9,800**		**8,400**		**590**		10,000	U	**9,400**		**5,200**		**3,300**		**26**	
78-87-5	**1,2-Dichloropropane**	1	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
541-73-1	**1,3-Dichlorobenzene**	3	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
142-28-9	**1,3-Dichloropropane**	5											5,000	U	500	U	500	U	250	U	5	U
106-46-7	**1,4-Dichlorobenzene**	3	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
123-91-1	**1,4-Dioxane**	0.35			5,000	U	5,000	U	10000	U	10,000	U	500,000	U (V-05)	50,000	U (V-05)	50,000	U	25,000	U	500	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	1,000	U	250	U	**150**	**J**	500	U	250	U	200,000	U	20,000	U	20,000	U	10,000	U	**380**	
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	500	U	250	U	250	U	500	U	250	U	10,000	U	10,000	U	10,000	U	5,000	U	100	U
108-10-1	**4-Methyl-2-pentanone**	NS	500	U	250	U	250	U	500	U	100	U	10,000	U	10,000	U	10,000	U	5,000	U	100	U
67-64-1	**Acetone**	50 (GV)	**1,600**		250	U	**1,300**		**1,300**		100	U	500,000	U	50,000	U	50,000	U	25,000	U	**9,200**	
71-43-2	**Benzene**	1	100	U	50	U	**20**	**J**	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
74-97-5	**Bromochloromethane**	5			50	U	50	U	100	U	50	U	10,000	U	1,000	U	1,000	U	500	U	10	U
75-27-4	**Bromodichloromethane**	50(GV)	100	U	50	U	50	U	100	U	20	U	5,000	U	500	U	500	U	500	U	5	U
75-25-2	**Bromoform**	50(GV)	100	U	50	U	50	U	100	U	20	U	20,000	U	1,000	U	1,000	U	500	U	10	U (R-05)
74-83-9	**Bromomethane**	5	100	U	50	U	50	U	100	U	20	U	20,000	U	2,000	U	2,000	U (R-05)	1,000	U (R-05)	20	U
75-15-0	**Carbon Disulfide**	NS	100	U	50	U	50	U	100	U	20	U	40,000	U	4,000	U	4,000	U	2,000	U	40	U
56-23-5	**Carbon Tetrachloride**	5	100	U	50	U	50	U	100	U	20	U	50,000	U	5,000	U	5,000	U	2,500	U	50	U
108-90-7	**Chlorobenzene**	5	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
75-00-3	**Chloroethane**	5	100	U	**47**	**J**	50	U	100	U	50	U	20,000	U	2,000	U	2,000	U	1,000	U	20	U
67-66-3	**Chloroform**	7	**570**		50	U	**370**		**360**		20	U	20,000	U	2,000	U	2,000	U	1,000	U	20	U
74-87-3	**Chloromethane**	5	100	U	50	U	**34**	**J**	100	U	20	U	20,000	U	1,000	U	2,000	U	1,000	U	20	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	100	U	50	U	50	U	100	U	20	U	5,000	U	1,000	U	500	U	250	U	5	U
10061-02-6	**trans-1,3-Dichloropropene**		100	U	50	U	50	U	100	U	20	U	5,000	U	1,000	U	1,000	U	250	U	5	U
110-82-7	**Cyclohexane**	NS	100	U	50	U	50	U	100	U	20	U	50,000	U	2,000	U	5,000	U	2,500	U	50	U
124-48-1	**Dibromochloromethane**	50(GV)	100	U	50	U	50	U	100	U	20	U	5,000	U	2,000	U	500	U	250	U	5	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	100	U	50	U	50	U	100	U	20	U	20,000	U (V-05)	2,000	U	2,000	U	1,000	U	20	U (V-05)
75-09-2	**Dichloromethane**	5																				
64-17-5	**Ethanol (ug/L)**	NS															50,000	U	5,000	U	**5,300**	
100-41-4	**Ethyl Benzene**	5	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
98-82-8	**Isopropylbenzene**	5	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
79-20-9	**Methyl Acetate**	NS	100	U	50	U	50	U	100	U	50	U	50,000	U	1,000	U (V-05)	1,000	U	1,000	U	10	U (L-04)
1634-04-4	**Methyl tert-butyl ether**	10(GV)	**85**	**J**	50	U	**43.5**	**J**	**54**	**J**	50	U	10,000	U	1,000	U	1,000	U	500	U	10	U
108-88-3	**Methylbenzene**	5																				
108-87-2	**Methylcyclohexane**	50	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
75-09-2	**Methylene chloride**	5	100	U	50	U	**19.5**	**J**	100	U	20	U	50,000	U	5,000	U	5,000	U	2,500	U	50	U
179601-23-1	**m/p-Xylenes**	5	200	U	100	U	100	U	200	U	40	U	20,000	U	2,000	U	2,000	U	1,000	U	20	U
95-47-6	**o-Xylenes**	5	200	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
100-42-5	**Styrene**	5	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
127-18-4	**Tetrachloroethene**	5	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
108-88-3	**Toluene**	5	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	100	U	50	U	50	U	100	U	20	U	10,000	U	1,000	U	500	U	500	U	10	U
79-01-6	**Trichloroethene**	5	**520**		50	U	**59.5**		**73**	**J**	20	U	10,000	U	1,000	U	1,000	U	500	U	10	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	100	U	50	U	50	U	100	U	20	U	20,000	U	2,000	U	2,000	U	1,000	U	20	U
75-01-4	**Vinyl chloride**	2	**320**		50	U	**1,400**		100	U	20	U	20,000	U	2,000	U	2,000	U	**1,100**		20	U
	Total detected CVOCs	NS	**1,105,810**		**4,911**		**513,183**		**520,633**		**42,690**		**677,000**		**171,400**		**103,200**		**50,200**		**125**	
	Total detected VOCs	NS	**1,107,495**		**4,911**		**514,696**		**521,987**		**42,690**		**677,000**		**171,400**		**103,200**		**51,200**		**9,705**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		**48,700**		**47,900**		**92,300**	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-11		MHBP-11		MHBP-11		MHBP-11		MHBP-11		MHBP-12		MHBP-12		MHBP-12		MHBP-12 (2)		MHBP-12		MHBP-12		MHBP-12	
	Date		7/14/2017		1/26/2018		5/22/2018		6/6/2019		11/1/2021		August 1995 (1)		9/2/2005		1/17/2005		2/24/2011		6/18/2015 (5)		1/6/2016		3/8/2016	
	Screen Interval (ft bgs)		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20	
	Area		Area C		Area C		Area C		Area C		Area C		Area A		Area A		Area A		Area A		Area A		Area A		Area A	
CAS No.	*VOC (µg/l)*																									
71-55-6	1,1,1-Trichloroethane	5	1	U	1	U	1	U	1	U	**660**		**18,000**		**19,100**		**26,300**		**49,000**	D	**790**		**4,700**	D	**4,900**	D
79-34-5	1,1,2,2-Tetrachloroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
79-00-5	1,1,2-Trichloroethane	1	1	U	1	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	**0.5**	J	20	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	1	U	1	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
75-34-3	1,1-Dichloroethane	5	**6**		**1.3**		**4.9**		**1**		**380**		**290,000**		**276,000**		**272,000**		**370,000**	D	**1600**		**168,400**	D	**253,200**	D
75-35-4	1,1-Dichloroethene	5	**8**		1	U	**1.4**		1	U	20	U	10,000	U	5,000	U	5,000	U	**5,800**		**12.8**	J	**260**	D	**260**	
87-61-6	1,2,3-Trichlorobenzene	5	5	U																	20	U	1	U	20	U
120-82-1	1,2,4-Trichlorobenzene	5	1	U	1	U	1	U	1	U	20	U			10,000	U	10,000	U	100	U	20	U	1	U	20	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	5	U	5	U	5	U	5	U, V-05	20	U			10,000	U	10,000	U	100	U	20	U	1	U	20	U
106-93-4	1,2-Dibromoethane	NS	0.5	U	0.5	U	0.5	U	0.5	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
95-50-1	1,2-Dichlorobenzene	3	1	U	1	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
107-06-2	1,2-Dichloroethane	0.6	**3**		1	U	1	U	1	U	20	U	**38,000**		**48,400**		**40,000**		**51,000**	D	**390**		**25,500**	D	**33,800**	D
78-87-5	1,2-Dichloropropane	1	1	U	1	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	**13.7**		20	U
541-73-1	1,3-Dichlorobenzene	3	1	U	1	U	1	U	1	U	20	U							100	U	20	U	1	U	20	U
142-28-9	1,3-Dichloropropane	5	0.5	U																						
106-46-7	1,4-Dichlorobenzene	3	1	U	1	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
123-91-1	1,4-Dioxane	0.35	50	U (V-05)							**1.9**										2,000	U	100	U	2,000	U
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	**120**		20	U	20	U	20	U	200	U			10,000	U	10,000	U	**910**	J	100	U	**350**		**600**	
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	10	U	10	U	10	U	10	U	100	U			50,000	U	50,000	U	500	U	100	U	**6.7**		100	U
108-10-1	4-Methyl-2-pentanone	NS	10	U	10	U	10	U	10	U	100	U			5,000	U	5,000	U	**570**		100	U	**300**		440	
67-64-1	Acetone	50 (GV)	**1,700**		**250**		50	U	50	U	**64**	J			10,000	U	10,000	U	**3,800**		100	U	**1,600**	D	**2,400**	
71-43-2	Benzene	1	1	U	1	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	**1.4**		20	U
74-97-5	Bromochloromethane	5	1	U																	20	U	1	U	20	U
75-27-4	Bromodichloromethane	50(GV)	0.5	U	0.5	U	0.5	U	0.5	U	20	U			5,000	U	5,000	U	100	U	20	U	**0.75**	J	20	U
75-25-2	Bromoform	50(GV)	2	U	1	U	1	U	1	U	20	U							100	U	20	U	1	U	20	U
74-83-9	Bromomethane	5	5	U	2	U	2	U	5	U	20	U			10,000	U	10,000	U	100	U	20	U	1	U	20	U
75-15-0	Carbon Disulfide	NS	4	U	4	U	4	U	5	U	20	U			5,000	U	5,000	U	100	U	20	U	**6.2**		20	U
56-23-5	Carbon Tetrachloride	5	5	U	5	U	5	U	5	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
108-90-7	Chlorobenzene	5	1	U	1	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
75-00-3	Chloroethane	5	5	U	2	U	**3.1**		2	U	**31**				**2,900**	J	10,000	U	**2,300**		**67.6**		**9,800**	D	**7,100**	D
67-66-3	Chloroform	7	2	U	2	U	2	U	2	U	20	U			5,000	U	5,000	U	**610**		20	U	**40.4**		**82**	
74-87-3	Chloromethane	5	5	U	2	U	2	U	2	U	20	U			10,000	U	10,000	U	100	U	20	U	**5.2**		20	U
156-59-2	cis-1,2-Dichloroethene (3)	5	**1.3**		1	U	1	U	1	U	20	U	10,000	U	5,000	U	5,000	U	100	U	20	U	**1.2**		20	U
10061-01-5	cis-1,3-Dichloropropene	0.4	0.5	U	0.5	U	0.5	U	0.5	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
10061-02-6	trans-1,3-Dichloropropene		0.5	U	0.5	U	0.5	U	0.5	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
110-82-7	Cyclohexane	NS									20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
124-48-1	Dibromochloromethane	50(GV)	2	U							20	U			5,000	U	5,000	U	100	U	20	U	**4.2**		20	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5	2	U (V-05)	2	U	2	U	2	U	20	U			10,000	U	10,000	U	100	U	20	U	1	U	20	U
75-09-2	Dichloromethane	5													**3,900**	J	20,000	U								
64-17-5	Ethanol (ug/L)	NS																								
100-41-4	Ethyl Benzene	5	1	U	1	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
98-82-8	Isopropylbenzene	5	1	U	2	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
79-20-9	Methyl Acetate	NS	1	(L-04,V-0	**22**		1	U	1	U	50	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
1634-04-4	Methyl tert-butyl ether	10(GV)	1	(L-04,V-0	1	U	1	U	1	U	**4.8**	J			5,000	U	5,000	U	**170**		20	U	**68.8**		**100**	
108-88-3	Methylbenzene	5													5,000	U	5,000	U								
108-87-2	Methylcyclohexane	50	1	U	1	U	1	U	1	U	20	U			5,000	U	5,000	U	100	U	20	U	1	U	20	U
75-09-2	Methylene chloride	5	5	U	5	U	5	U	5	U	20	U							**270**		**27.2**		**340**	D	**350**	
179601-23-1	m/p-Xylenes	5	2	U											10,000	U	10,000	U	200	U	20	U	2	U	40	U
95-47-6	o-Xylenes	5	1	U											10,000	U	10,000	U	200	U	20	U	1	U	20	U
100-42-5	Styrene	5	1	U	1	U	1	U	1	U	20	U							100	U	20	U	1	U	20	U
127-18-4	Tetrachloroethene	5	1	U	1	U	1	U	1	U	20	U	10,000	U	5,000	U	5,000	U	100	U	20	U	1	U	20	U
108-88-3	Toluene	5	1	U	1	U	**1.7**		1	U	20	U							100	U	20	U	1	U	20	U
156-60-5	trans-1,2-Dichloroethene (3)	5	1	(L-04,V-0	1	U	1	U	1	U	20	U	10,000	U	5,000	U	5,000	U	100	U	20	U	1	U	20	U
79-01-6	Trichloroethene	5	**1.2**		1	U	1	U	1	U	20	U	10,000	U	5,000	U	5,000	U	100	U	20	U	**0.22**	J	20	U
75-69-4	Trichlorofluoromethane (CFC-11)	5	2	U	2	U	2	U	2	U	20	U			10,000	U	10,000	U	100	U	20	U	1	U	20	U
75-01-4	Vinyl chloride	2	**14**		2	U	2	U	2	U	20	U	20,000	U	10,000	U	10,000	U	**400**		20	U	**200**	UD	**1,500**	
	Total detected CVOCs	NS	**34**		**1.3**		**9.4**		**1**		**1,071**		**346,000**		**350,300**		**338,300**		**479,380**		**2,888**		**209,266**		**301,632**	
	Total detected VOCs	NS	**1,854**		**273.3**		**11.1**		**1**		**1,139.8**		**346,000**		**350,300**		**338,300**		**484,830**		**2,888**		**211,599**		**304,732**	
	Acetic Acid (ug/L)	NS	**329,000**										NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-12		MHBP-12		MHBP-12		MHBP-12		MHBP-12		MHBP-12		MHBP-12		MHBP-12		MHBP-12	
	Date		5/3/2016		7/19/2016		9/23/2016		12/16/2016		2/8/2017		4/7/2017		7/14/2017		1/26/2018		5/22/2018	
	Screen Interval (ft bgs)		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20	
	Area		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A	
CAS No.	**VOC (µg/l)**																			
71-55-6	**1,1,1-Trichloroethane**	5	**2,600**		2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	20	U	1,200	U	500	U	500	U	200	U	10	U	1	U	2	U	0.5	U
79-00-5	**1,1,2-Trichloroethane**	1	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
75-34-3	**1,1-Dichloroethane**	5	**184,300**	**D**	**260,000**		**140,000**		**28,000**		**25,000**		**1,500**		**120**		**6.8**		**11**	
75-35-4	**1,1-Dichloroethene**	5	**330**		2,500	U	**1,500**		1,000	U	**480**		**52**		**190**		4	U	**1.6**	
87-61-6	**1,2,3-Trichlorobenzene**	5	20	U	12,000	U	5,000	U	5,000	U (V-05)	2,000	U	100	U	10	U				
120-82-1	**1,2,4-Trichlorobenzene**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	40	U	2	U	4	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	20	U	**12,000**		5,000	U	5,000	U	2,000	U	100	U	10	U	20	U	5	U
106-93-4	**1,2-Dibromoethane**	NS	20	U	1,200	U	500	U	500	U	200	U	10	U	1	U	2	U	0.5	U
95-50-1	**1,2-Dichlorobenzene**	3	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	**35,600**	**D**	**43,000**		**29,000**		**8,900**		**5,400**		**1,000**		**32**		4	U	1	U
78-87-5	**1,2-Dichloropropane**	1	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
142-28-9	**1,3-Dichloropropane**	5			1,200	U	500	U	500	U	200	U	10	U	1	U				
106-46-7	**1,4-Dichlorobenzene**	3	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
123-91-1	**1,4-Dioxane**	0.35	10,000	U	120,000	U (V-05)	50,000	U (V-05)	50,000	U	20,000	U	1,000	U	100	U (V-05)				
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	**380**	**J**	50,000	U	20,000	U	20,000	U	8,000	U	**1,400**		**260**		**410**		20	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	250	U	25,000	U	10,000	U	10,000	U	4,000	U	200	U	20	U	40	U	10	U
108-10-1	**4-Methyl-2-pentanone**	NS	320	J	25,000	U	10,000	U	10,000	U	4,000	U	**620**		**42**		40	U	10	U
67-64-1	**Acetone**	50 (GV)	**2,300**		120,000	U	50,000	U	50,000	U	20,000	U	**7,000**		**1,600**		**3,700**	**MS-19**	**140**	
71-43-2	**Benzene**	1	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	**2.1**		4	U	1	U
74-97-5	**Bromochloromethane**	5	50	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U				
75-27-4	**Bromodichloromethane**	50(GV)	20	U	1,200	U	500	U	500	U	400	U	10	U	1	U	2	U	0.5	U
75-25-2	**Bromoform**	50(GV)	20	U	5,000	U	1,000	U	1,000	U	400	U	20	U	4	U	4	U	1	U
74-83-9	**Bromomethane**	5	20	U	5,000	U	2,000	U	2,000	U (R-05)	800	U (R-05)	40	U (R-05)	10	U	8	U MS-10	2	U
75-15-0	**Carbon Disulfide**	NS	20	U	10,000	U	4,000	U	4,000	U	1,600	U	80	U	8	U	16	U	4	U
56-23-5	**Carbon Tetrachloride**	5	20	U	12,000	U	5,000	U	5,000	U	2,000	U	100	U	10	U	20	U	5	U
108-90-7	**Chlorobenzene**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
75-00-3	**Chloroethane**	5	**1,900**		5,000	U	2,000	U	2,000	U	800	U	40	U	10	U	8	U	2	U
67-66-3	**Chloroform**	7	**110**		5,000	U	2,000	U	2,000	U	800	U	40	U	4	U	8	U	2	U
74-87-3	**Chloromethane**	5	20	U	5,000	U	1,000	U	2,000	U	800	U	40	U	5	U	8	U	2	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	**6.5**		4	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	20	U	1,200	U	5,000	U	500	U	200	U	10	U	1	U	2	U	0.5	U
10061-02-6	**trans-1,3-Dichloropropene**		20	U	1,200	U	1,000	U	1,000	U	200	U	10	U	1	U	2	U	0.5	U
110-82-7	**Cyclohexane**	NS	20	U	12,000	U	2,000	U	5,000	U	2,000	U	100	U						
124-48-1	**Dibromochloromethane**	50(GV)	20	U	1,200	U	2,000	U	500	U	200	U	10	U	4	U				
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	20	U	5,000	U (V-05)	2,000	U	2,000	U	800	U	40	U (V-05)	4	U (V-05)	8	U MS-10	2	U
75-09-2	**Dichloromethane**	5																		
64-17-5	**Ethanol (ug/L)**	NS							50,000	U	5,000	U	**2,800**							
100-41-4	**Ethyl Benzene**	5	20	U	2,500	U	1,000	U	1,000	U	20,000	U	20	U	2	U	4	U	1	U
98-82-8	**Isopropylbenzene**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	8	U	1	U
79-20-9	**Methyl Acetate**	NS	50	U	12,000	U	1,000	U (V-05)	1,000	U	800	U	20	U (L-04)	2	(L-04, V-0	**31**	**MS-09**	1	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	**60**	**J**	2,500	U	1,000	U	1,000	U	800	U	**34**		**5.5**	**L-04, V-05**	4	U	1	U
108-88-3	**Methylbenzene**	5																		
108-87-2	**Methylcyclohexane**	50	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
75-09-2	**Methylene chloride**	5	**220**		12,000	U	5,000	U	5,000	U	2,000	U	100	U	10	U	20	U	5	U
179601-23-1	**m/p-Xylenes**	5	40	U	5,000	U	2,000	U	2,000	U	400	U	40	U	4	U				
95-47-6	**o-Xylenes**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U				
100-42-5	**Styrene**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
127-18-4	**Tetrachloroethene**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
108-88-3	**Toluene**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	20	U	2	U	4	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	20	U	2,500	U	1,000	U	500	U	400	U	20	U	2	(L-04,V-0	4	U	1	U
79-01-6	**Trichloroethene**	5	20	U	2,500	U	1,000	U	1,000	U	400	U	**34**		**11**		4	U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	20	U	5,000	U	2,000	U	2,000	U	800	U	40	U	4	U	8	U	2	U
75-01-4	**Vinyl chloride**	2	**1,300**		5,000	U	2,000	U	2,000	U	800	U	**70**		**180**		8	U	2	U
	Total detected CVOCs	NS	**226,680**		**315,000**		**170,500**		**36,900**		**30,880**		**3,276**		**540**		**6.8**		**12.6**	
	Total detected VOCs	NS	**229,420**		**315,000**		**170,500**		**36,900**		**30,880**		**14,510**		**2,449**		**4,147.8**		**152.6**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		**226,000**		**266,000**		**302,000**		**168,000**					

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-12		MHBP-12		MHBP-13S		MHBP-13S		MHBP-13S		MHBP-13S		MHBP-13S (2)		MHBP-13S		MHBP-13S	
	Date		6/4/2019		11/1/2021		August 1995 (1)		8/31/2005		1/17/2006		4/2/2007		3/23/2011		6/17/2015 (5)		1/6/2016	
	Screen Interval (ft bgs)		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20	
	Area		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A	
CAS No.	**VOC (µg/l)**																			
71-55-6	**1,1,1-Trichloroethane**	5	1	U	1	U	**11,000**		**7,720**		**105**	**J**	500	U	**12**		**2.4**		100	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	0.5	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	1	U			250	U	250	U	500	U	1	U	**2.6**		100	U
75-34-3	**1,1-Dichloroethane**	5	**4.2**		**0.46**	**J**	**13,000**		**2,690**		**7,040**		**2,800**		**69**		**160**		100	U
75-35-4	**1,1-Dichloroethene**	5	1	U	**0.45**	**J**	**230**	**J**	**115**	**J**	250	U	500	U	**0.55**	**J**	**2.5**		100	U
87-61-6	**1,2,3-Trichlorobenzene**	5											500	U			1	U	100	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U			500	U	500	U	500	U	1	U	1	U	100	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	5	U	1	U			500	U	500	U	500	U	1	U	1	U	100	U
106-93-4	**1,2-Dibromoethane**	NS	0.5	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	1	U			250	U	250	U	500	U	**1.7**		**76.4**		**27**	**J**
107-06-2	**1,2-Dichloroethane**	0.6	1	U	**0.31**	**J**	**600**		**120**	**J**	**865**		**520**		**5.0**		**32.6**		100	U
78-87-5	**1,2-Dichloropropane**	1	1	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	1	U									1	U	1	U	100	U
142-28-9	**1,3-Dichloropropane**	5											500	U						
106-46-7	**1,4-Dichlorobenzene**	3	1	U	1	U			250	U	250	U	500	U	1	U	**14.4**		100	U
123-91-1	**1,4-Dioxane**	0.35			**13**												100	U	10,000	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	20	U	10	U			5,000	U	5,000	U	500	U	10	U	**600**		500	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	10	U	5	U									5	U	5	U	500	U
108-10-1	**4-Methyl-2-pentanone**	NS	10	U	5	U			2,500	U	2,500	U	500	U	5	U	5	U	500	U
67-64-1	**Acetone**	50 (GV)	50	U	10	U			5,000	U	5,000	U	500	UJ	10	U	**75.3**		500	U
71-43-2	**Benzene**	1	1	U	1	U			250	U	250	U	500	U	1	U	**13.4**		100	U
74-97-5	**Bromochloromethane**	5													1	U	1	U	100	U
75-27-4	**Bromodichloromethane**	50(GV)	0.5	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
75-25-2	**Bromoform**	50(GV)	1	U	1	U									1	U	1	U	100	U
74-83-9	**Bromomethane**	5	2	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
75-15-0	**Carbon Disulfide**	NS	5	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
56-23-5	**Carbon Tetrachloride**	5	5	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
108-90-7	**Chlorobenzene**	5	1	U	1	U			250	U	250	U	500	U	1	U	**2**		100	U
75-00-3	**Chloroethane**	5	2	U	**3.2**				**6,480**		**6,720**		**17,000**		**2,700**	**D**	**6,100**	**E**	**5,400**	
67-66-3	**Chloroform**	7	2	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
74-87-3	**Chloromethane**	5	2	U	1	U			500	U	500	U	500	U	1	U	1	U	100	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	1	U	**720**		**1,840**		**145**	**J**	500	U	1	U	**87.6**		100	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	0.5	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
10061-02-6	**trans-1,3-Dichloropropene**		0.5	U	1	U			250	U	250	U	500	U	1	U	1	U	100	U
110-82-7	**Cyclohexane**	NS			1	U			250	U	250	U	500	U	1	U	**42.5**		100	U
124-48-1	**Dibromochloromethane**	50(GV)			1	U			250	U	250	U	500	U	1	U	1	U	100	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	2	U	1	U			500	U	500	U	500	U	1	U	1	U	100	U
75-09-2	**Dichloromethane**	5							**165**	**J**	1000	U	500	U						
64-17-5	**Ethanol (ug/L)**	NS																		
100-41-4	**Ethyl Benzene**	5	1	U	1	U			250	U	250	U	500	U	1	U	**2.6**		100	U
98-82-8	**Isopropylbenzene**	5	1	U	1	U			250	U	250	U	500	U	1	U	**2.2**		100	U
79-20-9	**Methyl Acetate**	NS	1	U	2.5	U			250	U	250	U			1	U	1	U	100	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1	U	**0.41**	**J**			250	U	250	U	500	U	**0.73**	**J**	1	U	100	U
108-88-3	**Methylbenzene**	5							250	U	250	U								
108-87-2	**Methylcyclohexane**	50	1	U	1	U			250	U	250	U			**1.2**		**78.4**		100	U
75-09-2	**Methylene chloride**	5	5	U	1	U									**1.1**		**8.5**		100	U
179601-23-1	**m/p-Xylenes**	5							500	U	500	U	500	U	1	U	**5.7**		200	U
95-47-6	**o-Xylenes**	5							500	U	500	U	500	U	1	U	**1.6**		100	U
100-42-5	**Styrene**	5	1	U	1	U			250	U	250	U	500	UJ	1	U	1	U	100	U
127-18-4	**Tetrachloroethene**	5	1	U	1	U	**260**	**J**	250	U	250	U	500	U	1	U	**3.3**		100	U
108-88-3	**Toluene**	5	1	U	1	U									1	U	**32.6**		100	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U			250	U	250	U	500	U	1	U	**9.5**		100	U
79-01-6	**Trichloroethene**	5	1	U	1	U	**190**	**J**	**125**	**J**	250	U	500	U	1	U	**9.2**		100	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	2	U	1	U			500	U	500	U	500	U	1	U	1	U	100	U
75-01-4	**Vinyl chloride**	2	2	U	1	U	**290**	**J**	**1,060**		**140**	**J**	500	U	1	U	**48.9**		100	U
	Total detected CVOCs	NS	**4.2**		**4.42**		**26,290**		**20,315**		**15,015**		**20,320**		**2,788**		**6,594**		**5,427**	
	Total detected VOCs	NS	**4.2**		**4.83**		**26,290**		**20,315**		**15,015**		**20,320**		**2,791**		**7,406**		**5,427**	
	Acetic Acid (ug/L)	NS					NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-13S		MHBP-13S		MHBP-13S		MHBP-13S		MHBP-13S		MHBP-13S		MHBP-13S		MHBP-13S		MHBP-13S	
	Date		3/8/2016		5/1/2016		7/18/2016		9/22/2016		12/15/2016		2/7/2017		4/7/2017		7/13/2017		1/26/2018	
	Screen Interval (ft bgs)		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20	
	Area		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A	
CAS No.	VOC (µg/l)																			
71-55-6	1,1,1-Trichloroethane	5	210		4	U	5	U	10	U	10	U	5	U	1	U	2	U	20	U
79-34-5	1,1,2,2-Tetrachloroethane	5	50	U	4	U	2.5	U	5	U	5	U	2.5	U	0.5	U	1	U	10	U
79-00-5	1,1,2-Trichloroethane	1	50	U	4	U	5	U	10	U	10	U	5	U	1	U	2	U	20	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	50	U	4	U	5	U	10	U	10	U	5	U	1	U	2	U	20	U
75-34-3	1,1-Dichloroethane	5	150		14.2	J	170		29		28		8.2		7.6		12		29	
75-35-4	1,1-Dichloroethene	5	50	U	4	U	5	U	10	U	10	U	5	U	1	U	2	U	20	U
87-61-6	1,2,3-Trichlorobenzene	5	50	U	4	U	25	U	50	U	50	U	25	U	5	U	10	U		
120-82-1	1,2,4-Trichlorobenzene	5	50	U	4	U	5	U	10	U	10	U	5	U	2	U	2	U	20	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	50	U	4	U	25	U	50	U	50	U	25	U	5	U	10	U	100	U
106-93-4	1,2-Dibromoethane	NS	50	U	4	U	2.5	U	5	U	5	U	2.5	U	0.5	U	1	U	10	U
95-50-1	1,2-Dichlorobenzene	3	17	J	16.4	J	39		10	U	58		43		31		21		20	U
107-06-2	1,2-Dichloroethane	0.6	50	U	6.8	J	11		10	U	10	U	5	U	1.5		4	U	20	U
78-87-5	1,2-Dichloropropane	1	50	U	4	U	5	U	10	U	10	U	5	U	1	U	2	U	20	U
541-73-1	1,3-Dichlorobenzene	3	50	U	4	U	5	U	10	U	10	U	5	U	1	U	2	U	20	U
142-28-9	1,3-Dichloropropane	5					2.5	U	5	U	5	U	2.5	U	0.5	U	1	U		
106-46-7	1,4-Dichlorobenzene	3	50	U	4	U	6.2		10	U	10		10		13		13		20	U
123-91-1	1,4-Dioxane	0.35	5,000	U	2,000	U	250	U (V-05)	500	U (V-05)	500	U	250	U	69		100	U		
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	250	U	50	U	100	U	200	U	200	U	100	U	20	U	40	U	400	U
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	250	U	50	U	50	U	100	U	100	U	50	U	10	U	20	U	200	U
108-10-1	4-Methyl-2-pentanone	NS	250	U	20	U	50	U	100	U	100	U	50	U	10	U	20	U	200	U
67-64-1	Acetone	50 (GV)	250	U	20	U	250	U	500	U	500	U	250	U	50	U	100	U	1,000	U
71-43-2	Benzene	1	50	U	4	U	5	U	10	U	16		8.3		4.2		2	U	20	U
74-97-5	Bromochloromethane	5	50	U	10	U	5	U	10	U	10	U	5	U	1	U	2	U		
75-27-4	Bromodichloromethane	50(GV)	50	U	4	U	2.5	U	5	U	5	U	5	U	0.5	U	1	U	10	U
75-25-2	Bromoform	50(GV)	50	U	4	U	10	U	10	U	10	U	5	U	1	U	4	U	20	U
74-83-9	Bromomethane	5	50	U	4	U	10	U	20	U	20	U	10	U	2	U (R-05)	10	U	40	U
75-15-0	Carbon Disulfide	NS	50	U	4	U	20	U	40	U	40	U	20	U	4	U	8	U	80	U
56-23-5	Carbon Tetrachloride	5	50	U	4	U	25	U	50	U	50	U	25	U	5	U	10	U	100	U
108-90-7	Chlorobenzene	5	50	U	4	U	5	U	10	U	10	U	5	U	4.4		2.8		20	U
75-00-3	Chloroethane	5	5800		2700		3700		390		3300		380		190		86		1,200	
67-66-3	Chloroform	7	50	U	4	U	10	U	20	U	20	U	10	U	2	U	4	U	40	U
74-87-3	Chloromethane	5	50	U	4	U	10	U	20	U	20	U	10	U	2	U	10	U	40	U
156-59-2	cis-1,2-Dichloroethene (3)	5	50	U	8.2	J	7.4		10	U	10	U	5	U	3.1		6.9		20	U
10061-01-5	cis-1,3-Dichloropropene	0.4	50	U	4	U	2.5	U	5	U	5	U	2.5	U	0.5	U	1	U	10	U
10061-02-6	trans-1,3-Dichloropropene		50	U	4	U	2.5	U	5	U	10	U	2.5	U	0.5	U	1	U	10	U
110-82-7	Cyclohexane	NS	50	U	4	U	25	U	50	U	50	U	25	U	10					
124-48-1	Dibromochloromethane	50(GV)	50	U	4	U	2.5	U	20	U	5	U	2.5	U	0.5	U	4	U		
75-71-8	Dichlorodifluoromethane (cfc-12)	5	50	U	4	U	10	U (V-05)	20	U	20	U (V-05)	10	U	2	U (V-05)	4	U	40	U
75-09-2	Dichloromethane	5																		
64-17-5	Ethanol (ug/L)	NS									500	U	250	U (V-05)	690		260			
100-41-4	Ethyl Benzene	5	50	U	4	U	5	U	10	U	21		5	U	2.3		2		20	U
98-82-8	Isopropylbenzene	5	50	U	4	U	5	U	10	U	28		5	U	1.5		2		40	U
79-20-9	Methyl Acetate	NS	50	U	10	U	25	U	10	U (V-05)	10	U	10	U	1	U (L-04)	2	U (L-04)	20	U
1634-04-4	Methyl tert-butyl ether	10(GV)	50	U	10	U	5	U	10	U	10	U	5	U	1	U	2	U	20	U
108-88-3	Methylbenzene	5																		
108-87-2	Methylcyclohexane	50	50	U	4.6	J	5	U	10	U	12		17		24		6		20	U
75-09-2	Methylene chloride	5	50	U	32.2		25	U	50	U	50	U	25	U	5	U	10	U	100	U
179601-23-1	m/p-Xylenes	5	100	U	8	U	10	U	20	U	34		10	U	2	U	4	U		
95-47-6	o-Xylenes	5	50	U	4	U	5	U	10	U	25		5	U	1	U	2	U		
100-42-5	Styrene	5	50	U	4	U	5	U	10	U	10	U	5	U	1	U	2	U	20	U
127-18-4	Tetrachloroethene	5	50	U	4	U	5	U	10	U	12		5	U	1.5		2	U	20	U
108-88-3	Toluene	5	50	U	4	U	11		10	U	12		5	U	1		2	U	20	U
156-60-5	trans-1,2-Dichloroethene (3)	5	50	U	4	U	5	U	10	U	5	U	5.6		4.7		3.4		20	U
79-01-6	Trichloroethene	5	50	U	4	U	5	U	10	U	10		5	U	4.6		3.1		20	U
75-69-4	Trichlorofluoromethane (CFC-11)	5	50	U	4	U	10	U	20	U	20	U	10	U	2	U	4	U	40	U
75-01-4	Vinyl chloride	2	50	U	4	U	14		20	U	20	U	10	U	4.4		4	U	40	U
	Total detected CVOCs	NS	6,177		2,778		3,959		419		3,418		447		974		408		1,229	
	Total detected VOCs	NS	6,177		2,782		3,959		419		3,566		472		1,068		414		1,229	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		290	U	290		290	U	5,800	U		

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-13S		MHBP-13S		MHBP-13S		MHBP-13D		MHBP-13D		MHBP-13D		MHBP-13D (2)		MHBP-15		MHBP-15		MHBP-15	
	Date		5/22/2018		6/4/2019		11/1/2021		August 1995 (1)		8/31/2005		1/12/2006		3/23/2011		August 1995 (1)		9/7/2005		1/12/2006	
	Screen Interval (ft bgs)		10-20		10-20		10-20		38.5-43.5		38.5-43.5		38.5-43.5		38.5-43.5		4.5-14.5		4.5-14.5		4.5-14.5	
	Area		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A	
CAS No.	VOC (µg/l)																					
71-55-6	1,1,1-Trichloroethane	5	50	U D	50	U D	10	U		U	0.34	J	0.48	J	1.0	U		U	0.48	J	0.5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	2.5	U D	2.5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
79-00-5	1,1,2-Trichloroethane	1	5	U D	5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	5	U D	5	U D	10	U			0.59	J	0.5	U	1.0	U			0.5	U	0.5	U
75-34-3	1,1-Dichloroethane	5	16	D	52	D	18		41		13.7		27.3		21		1	J	2.29		0.38	J
75-35-4	1,1-Dichloroethene	5	5	U D	5	U D	10	U	4	J	2.93		3.71		3.5			U	0.23	J	0.5	U
87-61-6	1,2,3-Trichlorobenzene	5																				
120-82-1	1,2,4-Trichlorobenzene	5	5	U D	5	U D	10	U			1	U	1	U					1	U	1	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	25	U D	25	U D	10	U			1	U	1	U	1.0	U			1	U	1	U
106-93-4	1,2-Dibromoethane	NS	2.5	U D	2.5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	3	14	D	7.2	D	15				0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
107-06-2	1,2-Dichloroethane	0.6	5	U D	5	U D	10	U	18		22.8		22.2		20.0			U	0.94		0.5	U
78-87-5	1,2-Dichloropropane	1	5	U D	5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
541-73-1	1,3-Dichlorobenzene	3	5	U D	5	U D	10	U							1.0	U						
142-28-9	1,3-Dichloropropane	5																				
106-46-7	1,4-Dichlorobenzene	3	7	D	6.9	D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
123-91-1	1,4-Dioxane	0.35					110	E														
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	100	U D	100	U D	100	U			10	U	10	U	10	U			10	U	10	U
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	50	U D	50	U D	50	U			5	U	5	U	5.0	U			5	U	5	U
108-10-1	4-Methyl-2-pentanone	NS	50	U D	50	U D	50	U			5	U	5	U	5.0	U			5	U	5	U
67-64-1	Acetone	50 (GV)	250	U D	250	U D	100	U			10	U	10	U	10	U			10	U	10	U
71-43-2	Benzene	1	5	U D	5	U D	10	U			1.77		2.25		2.4				0.5	U	0.5	U
74-97-5	Bromochloromethane	5																				
75-27-4	Bromodichloromethane	50(GV)	2.5	U D	2.5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
75-25-2	Bromoform	50(GV)	5	U D	5	U D	10	U							1.0	U						
74-83-9	Bromomethane	5	10	U D	10	U D	10	U			1	U	1	U	1.0	U			1	U	1	U
75-15-0	Carbon Disulfide	NS	20	U D	25	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
56-23-5	Carbon Tetrachloride	5	25	U D	25	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
108-90-7	Chlorobenzene	5	5	U D	6.1	D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
75-00-3	Chloroethane	5	390	D	600	D	550				12.1		4.39		3.5				1	U	1	U
67-66-3	Chloroform	7	10	U D	10	U D	10	U			0.20	J	0.18	J	1.0	U			0.5	U	0.5	U
74-87-3	Chloromethane	5	10	U D	10	U D	10	U			1	U	1	U	1.0	U			1	U	1	U
156-59-2	cis-1,2-Dichloroethene (3)	5	5	U D	5	U D	10	U	28		36.2		46		73			U	2.4		0.17	J
10061-01-5	cis-1,3-Dichloropropene	0.4	2.5	U D	2.5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene		2.5	U D	2.5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
110-82-7	Cyclohexane	NS					2.8	J			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
124-48-1	Dibromochloromethane	50(GV)					10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5	10	U D	10	U D	10	U			0.16	J	1	U	1.0	U			1	U	1	U
75-09-2	Dichloromethane	5																	2	U	2	U
64-17-5	Ethanol (ug/L)	NS																				
100-41-4	Ethyl Benzene	5	5	U D	5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
98-82-8	Isopropylbenzene	5	5	U D	5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
79-20-9	Methyl Acetate	NS	5	U D	5	U D	25	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
1634-04-4	Methyl tert-butyl ether	10(GV)	5	U D	5	U D	2.2	J			1.49		3.66		2.6				0.5	U	0.2	J
108-88-3	Methylbenzene	5									0.5	U	0.5	U					0.5	U	0.5	U
108-87-2	Methylcyclohexane	50	5	U D	5	U D	1.6	J			0.5	U	0.5	U	1.0	U						
75-09-2	Methylene chloride	5	25	U D	25	U D	10	U							1.0	U						
179601-23-1	m/p-Xylenes	5									0.5	U	0.5	U	2.0	U			1	U	1	U
95-47-6	o-Xylenes	5									0.5	U	0.5	U	2.0	U			1	U	1	U
100-42-5	Styrene	5	5	U D	5	U D	10	U			0.5	U	0.5	U	1.0	U			0.5	U	0.5	U
127-18-4	Tetrachloroethene	5	5	U D	5	U D	10	U	3	J	2.17		3.06		2.8			U	0.5	U	0.5	U
108-88-3	Toluene	5	5	U D	5	U D	10	U							1.0	U						
156-60-5	trans-1,2-Dichloroethene (3)	5	5	U D	5	U D	10	U			0.5	U	0.5	U	1.0	U		U	1.07			U
79-01-6	Trichloroethene	5	5	U D	5	U D	10	U	19		18.5		22.1		30		8		6.66		1.64	
75-69-4	Trichlorofluoromethane (CFC-11)	5	10	U D	10	U D	10	U			1	U	1	U	1.0	U			1	U	1	U
75-01-4	Vinyl chloride	2	10	U D	11	D	10	U	19		21.5		21.9		30			U	1	U	1	U
	Total detected CVOCs	NS	427		683.2		583		132		131		151		186		9		14		2	
	Total detected VOCs	NS	427		683.2		589.6		132		134		157		189		9		14		2	
	Acetic Acid (ug/L)	NS							NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-19S		MHBP-19S		MHBP-19S		MHBP-19D		MHBP-19D		MHBP-19D		MHBP-21		MHBP-21	
	Date		9/11/1995		9/7/2005		3/22/2011		9/11/1995		9/7/2005		1/12/2006		August 1995 (1)		12/11/2012	
	Screen Interval (ft bgs)		2-12		2-12		2-12		43-48		43-48		43-48		3-13		3-13	
	Area		80-ft South of Area A		80-ft South of Area A		80-ft South of Area A		80-ft South of Area A		80-ft South of Area A		80-ft South of Area A		Area B (vicinity)		Area B (vicinity)	
CAS No.	*VOC (µg/l)*																	
71-55-6	**1,1,1-Trichloroethane**	5		U	0.5	U	1	U		U	0.5	U	0.5	U		U	1	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5			0.5	U	1	U			0.5	U	0.5	U			1	U
79-00-5	**1,1,2-Trichloroethane**	1			0.5	U	1	U			0.5	U	0.5	U			1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5			0.5	U	1	U			0.5	U	0.5	U			1	U
75-34-3	**1,1-Dichloroethane**	5	**1**	**J**	**0.38**	**J**	1	U		U	**1.41**		**1.35**			U	1	U
75-35-4	**1,1-Dichloroethene**	5		U	0.5	U	1	U		U	0.5	U	0.5	U		U	1	U
87-61-6	**1,2,3-Trichlorobenzene**	5																
120-82-1	**1,2,4-Trichlorobenzene**	5			1	U	1	U			1	U	1	U			1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04			1	U	1	U			1	U	1	U			1	U
106-93-4	**1,2-Dibromoethane**	NS			0.5	U	1	U									1	U
95-50-1	**1,2-Dichlorobenzene**	3			0.5	U	1	U			0.5	U	0.5	U			1	U
107-06-2	**1,2-Dichloroethane**	0.6		U	**0.43**	**J**	1	U		U	0.5	U	0.5	U		U	1	U
78-87-5	**1,2-Dichloropropane**	1			0.5	U	1	U			0.5	U	0.5	U			1	U
541-73-1	**1,3-Dichlorobenzene**	3					1	U									1	U
142-28-9	**1,3-Dichloropropane**	5																
106-46-7	**1,4-Dichlorobenzene**	3			0.5	U	1	U			0.5	U	0.5	U			1	U
123-91-1	**1,4-Dioxane**	0.35																
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)			10	U	10	U			10	U	10	U			10	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50			5	U	5	U			5	U	5	U			5	U
108-10-1	**4-Methyl-2-pentanone**	NS			5	U	5	U			10	U	10	U			5	U
67-64-1	**Acetone**	50 (GV)			10	U	1	U			0.5	U	0.5	U			10	U
71-43-2	**Benzene**	1			0.5	U	1	U			0.5	U	0.5	U			1	U
74-97-5	**Bromochloromethane**	5																
75-27-4	**Bromodichloromethane**	50(GV)			0.5	U	1	U			0.5	U	0.5	U			1	U
75-25-2	**Bromoform**	50(GV)					1	U									1	U
74-83-9	**Bromomethane**	5			1	U	1	U			1	U	1	U			1	U
75-15-0	**Carbon Disulfide**	NS			0.5	U	1	U			0.5	U	0.5	U			1	U
56-23-5	**Carbon Tetrachloride**	5			0.5	U	1	U			0.5	U	0.5	U			1	U
108-90-7	**Chlorobenzene**	5			0.5	U	1	U			0.5	U	0.5	U			1	U
75-00-3	**Chloroethane**	5			1	U	1	U			1	U	1	U			1	U
67-66-3	**Chloroform**	7			0.5	U	1	U			0.5	U	0.5	U			1	U
74-87-3	**Chloromethane**	5			1	U	1	U			1	U	1	U			1	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5		U	0.5	U	1	U		U	0.5	U	0.5	U		U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4			0.5	U	1	U			0.5	U	0.5	U			1	U
10061-02-6	**trans-1,3-Dichloropropene**				0.5	U	1	U			0.5	U	0.5	U			1	U
110-82-7	**Cyclohexane**	NS			0.5	U	1	U			0.5	U	0.5	U			1	U
124-48-1	**Dibromochloromethane**	50(GV)			0.5	U	1	U			0.5	U	0.5	U			1	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5			1	U	1	U			1	U	1	U			1	U
75-09-2	**Dichloromethane**	5			**0.26**	**J**					2	U	2	U				
64-17-5	**Ethanol (ug/L)**	NS																
100-41-4	**Ethyl Benzene**	5			0.5	U	1	U			0.5	U	0.5	U			1	U
98-82-8	**Isopropylbenzene**	5			0.5	U	1	U			0.5	U	0.5	U			1	U
79-20-9	**Methyl Acetate**	NS			0.5	U	1	U			0.5	U	0.5	U			1	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)			0.5	U	1	U			**19.4**		**18.7**				1	U
108-88-3	**Methylbenzene**	5			0.5	U					0.5	U	0.5	U				
108-87-2	**Methylcyclohexane**	50			0.5	U	1	U			0.5	U	0.5	U			1	U
75-09-2	**Methylene chloride**	5					1	U									1	U
179601-23-1	**m/p-Xylenes**	5			1	U	2	U			1	U	1	U			2	U
95-47-6	**o-Xylenes**	5			1	U	2	U			1	U	1	U			2	U
100-42-5	**Styrene**	5			0.5	U	1	U			0.5	U	0.5	U			1	U
127-18-4	**Tetrachloroethene**	5		U	0.5	U	1	U		U	0.5	U	0.5	U		U	1	U
108-88-3	**Toluene**	5					1	U									1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5			0.5	U	1	U			0.5	U	0.5	U			1	U
79-01-6	**Trichloroethene**	5		U	0.5	U	1	U		U						U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5			1	U	1	U			1	U	1	U			1	U
75-01-4	**Vinyl chloride**	2		U	1	U	1	U		U	1	U	1	U		U	1	U
	Total detected CVOCs	NS	**1**		**1.07**		**ND**		**ND**		**1.41**		**1.35**		**ND**		**ND**	
	Total detected VOCs	NS	**1**		**1.07**		**ND**		**ND**		**21**		**20**		**ND**		**ND**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-21		MHBP-21		MHBP-21		MHBP-21		MHBP-21		MHBP-21		MHBP-21		MHBP-21	
	Date		6/18/2015 (5)		1/5/2016		3/9/2016		5/3/2016		7/19/2016		9/21/2016		12/14/2016		2/7/2017	
	Screen Interval (ft bgs)		3-13		3-13		3-13		3-13		3-13		3-13		3-13		3-13	
	Area		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)	
CAS No.	*VOC (µg/l)*																	
71-55-6	**1,1,1-Trichloroethane**	5	**12**		1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
75-34-3	**1,1-Dichloroethane**	5	**1.8**		1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
75-35-4	**1,1-Dichloroethene**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
87-61-6	**1,2,3-Trichlorobenzene**	5	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U
106-93-4	**1,2-Dibromoethane**	NS	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
78-87-5	**1,2-Dichloropropane**	1	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
142-28-9	**1,3-Dichloropropane**	5									0.5	U	0.5	U	0.5	U	0.5	U
106-46-7	**1,4-Dichlorobenzene**	3	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
123-91-1	**1,4-Dioxane**	0.35	100	U	100	U	100	U	100	U	50	U (V-05)	50	U (V-05)	50	U	50	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	5	U	5	U	5	U	2.5	U	20	U	20	U	20	U	20	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	5	U	5	U	5	U	2.5	U	10	U	10	U	10	U	10	U
108-10-1	**4-Methyl-2-pentanone**	NS	5	U	5	U	5	U	1	U	10	U	10	U	10	U	10	U
67-64-1	**Acetone**	50 (GV)	5	U	5	U	5	U	1	U	50	U	50	U	50	U	50	U
71-43-2	**Benzene**	1	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
74-97-5	**Bromochloromethane**	5	1	U	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U
75-27-4	**Bromodichloromethane**	50(GV)	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	1	U
75-25-2	**Bromoform**	50(GV)	1	U	1	U	1	U	0.2	U	2	U	2	U	1	U	1	U
74-83-9	**Bromomethane**	5	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U
75-15-0	**Carbon Disulfide**	NS	1	U	1	U	1	U	0.2	U	4	U	4	U	4	U	4	U
56-23-5	**Carbon Tetrachloride**	5	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U
108-90-7	**Chlorobenzene**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
75-00-3	**Chloroethane**	5	1	U	1	U	1	U	0.5	U	2	U	2	U	2	U	2	U
67-66-3	**Chloroform**	7	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U
74-87-3	**Chloromethane**	5	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U
10061-02-6	**trans-1,3-Dichloropropene**		1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	1	U	0.5	U
110-82-7	**Cyclohexane**	NS	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U
124-48-1	**Dibromochloromethane**	50(GV)	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	1	U	1	U	1	U	0.2	U	2	U (V-05)	2	U	2	U (V-05)	2	U
75-09-2	**Dichloromethane**	5																
64-17-5	**Ethanol (ug/L)**	NS													50	U	50	U (V-05)
100-41-4	**Ethyl Benzene**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
98-82-8	**Isopropylbenzene**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
79-20-9	**Methyl Acetate**	NS	1	U	1	U	1	U	0.5	U	5	U	5	U (V-05)	1	U	2	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1	U	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U
108-88-3	**Methylbenzene**	5																
108-87-2	**Methylcyclohexane**	50	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
75-09-2	**Methylene chloride**	5	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U
179601-23-1	**m/p-Xylenes**	5	1	U	2	U	2	U	0.4	U	2	U	2	U	2	U	2	U
95-47-6	**o-Xylenes**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
100-42-5	**Styrene**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
127-18-4	**Tetrachloroethene**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
108-88-3	**Toluene**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	0.2	U	1	U	1	U	0.5	U	1	U
79-01-6	**Trichloroethene**	5	**0.36**	**J**	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U
75-01-4	**Vinyl chloride**	2	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U
	Total detected CVOCs	NS	**14**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	Total detected VOCs	NS	**14**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		290	U	290	U

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-21		MHBP-21		MHBP-21D		MHBP-21D		MHBP-21D		MHBP-21D		MHBP-21D		MHBP-21D		MHBP-21D		MHBP-21D	
	Date		4/7/2017		7/12/2017		1/5/2016		3/9/2016		5/3/2016		7/19/2016		9/21/2016		12/14/2016		2/7/2017		4/7/2017	
	Screen Interval (ft bgs)		3-13		3-13		3-13		3-13		3-13		3-13		3-13		3-13		3-13		3-13	
	Area		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)	
CAS No.	VOC (µg/l)																					
71-55-6	1,1,1-Trichloroethane	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
79-34-5	1,1,2,2-Tetrachloroethane	5	0.5	U	0.5	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
79-00-5	1,1,2-Trichloroethane	1	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
75-34-3	1,1-Dichloroethane	5	**1**		1	U	**0.41**	**J**	1	U	0.2	U	1	U	1	U	1	U	1	U	**320**	
75-35-4	1,1-Dichloroethene	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	**120**	
87-61-6	1,2,3-Trichlorobenzene	5	5	U	5	U	1	U	1	U	0.2	U	5	U	5	U	5	U (V-05)	5	U	5	U
120-82-1	1,2,4-Trichlorobenzene	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U (V-05)	1	U	1	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	5	U	5	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U	5	U
106-93-4	1,2-Dibromoethane	NS	0.5	U	0.5	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	3	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
107-06-2	1,2-Dichloroethane	0.6	1	U	2	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
78-87-5	1,2-Dichloropropane	1	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
541-73-1	1,3-Dichlorobenzene	3	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
142-28-9	1,3-Dichloropropane	5	0.5	U	0.5	U							0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	3	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
123-91-1	1,4-Dioxane	0.35	50	U	50	U	**140**		**150**		**130**		**160**	**V-05**	**87**	**V-05**	**200**		**200**		**160**	
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	20	U	20	U	5	U	5	U	2.5	U	20	U	20	U	20	U	20	U	20	U
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	10	U	10	U	5	U	5	U	2.5	U	10	U	10	U	10	U	10	U	10	U
108-10-1	4-Methyl-2-pentanone	NS	10	U	10	U	5	U	5	U	1	U	10	U	10	U	10	U	10	U	10	U
67-64-1	Acetone	50 (GV)	50	U	50	U	5	U	5	U	1	U	50	U	50	U	50	U	50	U	50	U
71-43-2	Benzene	1	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
74-97-5	Bromochloromethane	5	1	U	1	U	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U	1	U
75-27-4	Bromodichloromethane	50(GV)	0.5	U	0.5	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U
75-25-2	Bromoform	50(GV)	2	U	2	U	1	U	1	U	0.2	U	2	U	2	U	2	U	1	U	2	U
74-83-9	Bromomethane	5	5	U	5	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	5	U
75-15-0	Carbon Disulfide	NS	4	U	4	U	1	U	1	U	0.2	U	4	U	4	U	4	U	4	U	4	U
56-23-5	Carbon Tetrachloride	5	5	U	5	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U	5	U
108-90-7	Chlorobenzene	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
75-00-3	Chloroethane	5	2	U	5	U	1	U	1	U	0.5	U	2	U	2	U	2	U	2	U	**2.4**	
67-66-3	Chloroform	7	2	U	2	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	2	U
74-87-3	Chloromethane	5	2	U	5	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	2	U
156-59-2	cis-1,2-Dichloroethene (3)	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
10061-01-5	cis-1,3-Dichloropropene	0.4	0.5	U	0.5	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene		0.5	U	0.5	U	1	U	1	U	0.2	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U
110-82-7	Cyclohexane	NS	5	U			1	U	1	U	0.2	U	5	U	5	U	5	U	5	U	5	U
124-48-1	Dibromochloromethane	50(GV)	1	U	2	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5	2	U	2	U	1	U	1	U	0.2	U	2	U (V-05)	2	U	2	U (V-05)	2	U	2	U
75-09-2	Dichloromethane	5																				
64-17-5	Ethanol (ug/L)	NS	50	U	50	U											50	U	50	U (V-05)	50	U
100-41-4	Ethyl Benzene	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
98-82-8	Isopropylbenzene	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
79-20-9	Methyl Acetate	NS	1	U (L-04, V-05)	1	U (L-04)	1	U	1	U	0.5	U	5	U	5	U (V-05)	5	U	2	U	1	U (L-04,V-05)
1634-04-4	Methyl tert-butyl ether	10(GV)	1	U	1	U	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U	1	U
108-88-3	Methylbenzene	5																				
108-87-2	Methylcyclohexane	50	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
75-09-2	Methylene chloride	5	5	U	5	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U	5	U
179601-23-1	m/p-Xylenes	5	2	U	2	U	2	U	2	U	0.4	U	2	U	2	U	2	U	2	U	2	U
95-47-6	o-Xylenes	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
100-42-5	Styrene	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
127-18-4	Tetrachloroethene	5	1	U	1	U	1	U	1	U	0.2	U	1	U	0.5	U	1	U	1	U	1	U
108-88-3	Toluene	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
156-60-5	trans-1,2-Dichloroethene (3)	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
79-01-6	Trichloroethene	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U
75-69-4	Trichlorofluoromethane (CFC-11)	5	2	U (L-04)	2	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	2	U (L-04)
75-01-4	Vinyl chloride	2	2	U	2	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	**190**	
	Total detected CVOCs	NS	**1**		**ND**		**0.41**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**632**	
	Total detected VOCs	NS	**1**		**ND**		**140.41**		**150**		**130**		**160**		**87**		**200**		**200**		**792**	
	Acetic Acid (ug/L)	NS	290	U	5,800	U	NA		NA		NA		NA		NA		290	U	290	U	290	U

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHBP-21D		MHBP-21D		MHBP-21D		MHBP-21D		MHBP-21D		MHC-23		MHC-23		MHC-23		MHC-23		MHC-27		MHC-29	
	Date		7/12/2017		1/26/2018		5/22/2018		6/6/2019		11/3/2021		August 1995 (1)		5/23/2018		6/5/2019		11/3/2021		August 1995 (1)		August 1995 (1)	
	Screen Interval (ft bgs)		3-13		3-13		3-13		3-13		3-13		3-13		3-13		3-13		3-13		3-13		10-20	
	Area		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		10-feet East of Area A		10-feet East of Area A		10-feet East of Area A		10-feet East of Area A		60-ft NE of Area B		Area C	
CAS No.	*VOC (µg/l)*																							
71-55-6	**1,1,1-Trichloroethane**	5	4	U	1	U	1	U	1	U	1	U	**12,000**		50	U D	**110**	**D**	130	U	**6**		**580,000**	
79-34-5	**1,1,2,2-Tetrachloroethane**	5	2	U	0.5	U	0.5	U	0.5	U	1	U			25	U D	12	U D	130	U				
79-00-5	**1,1,2-Trichloroethane**	1	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	4	U	1	U	1	U	1	U	1	U			50.0	U D	25.0	U D	130.0	U				
75-34-3	**1,1-Dichloroethane**	5	**120**		**130**		**98**		**59**		**27**		**1,200**		**1,700**	**D**	**260**	**D**	**130**		**25**		**53,000**	
75-35-4	**1,1-Dichloroethene**	5	**29**		**37**		**30**		**17**		**6.1**		**200**	**J**	50	U D	25	U D	130	U	**4**	**J**	25,000	U
87-61-6	**1,2,3-Trichlorobenzene**	5	20	U																				
120-82-1	**1,2,4-Trichlorobenzene**	5	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	20	U	5	U	5	U	5	U	1	U			250	U D	120	U D	130	U				
106-93-4	**1,2-Dibromoethane**	NS	2	U	0.5	U	0.5	U	0.5	U	1	U			25	U D	12	U D	130	U				
95-50-1	**1,2-Dichlorobenzene**	3	4	U	1	U	1	U	1	U	1	U			**100**	**D**	**62**	**D**	130	U				
107-06-2	**1,2-Dichloroethane**	0.6	8	U	1	U	1	U	1	U	1	U	**110**	**J**	50	U D	25	U D	130	U	**8**		**18,000**	**J**
78-87-5	**1,2-Dichloropropane**	1	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
541-73-1	**1,3-Dichlorobenzene**	3	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
142-28-9	**1,3-Dichloropropane**	5	2	U																				
106-46-7	**1,4-Dichlorobenzene**	3	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
123-91-1	**1,4-Dioxane**	0.35	**200**								**140**	**E**							**2.9**					
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	80	U	20	U	20	U	20	U	10	U			1,000	U D	500	U D	1,300	U				
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	40	U	10	U	10	U	10	U	5	U			500	U D	250	U D	630	U				
108-10-1	**4-Methyl-2-pentanone**	NS	40	U	10	U	10	U	10	U	5	U			500	U D	250	U D	630	U				
67-64-1	**Acetone**	50 (GV)	200	U	50	U	50	U	50	U	10	U			2,500	U D	1,200	U D	1,300	U				
71-43-2	**Benzene**	1	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
74-97-5	**Bromochloromethane**	5	4	U																				
75-27-4	**Bromodichloromethane**	50(GV)	2	U	0.5	U	0.5	U	0.5	U	1	U			25	U D	12	U D	130	U				
75-25-2	**Bromoform**	50(GV)	8	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
74-83-9	**Bromomethane**	5	20	U	2	U	2	U	5	U	1	U			100	U D V-05	50	U D	130	U				
75-15-0	**Carbon Disulfide**	NS	16	U	4	U	4	U	5	U	1	U			200	U D	120	U D	130	U				
56-23-5	**Carbon Tetrachloride**	5	20	U	5	U	5	U	5	U	1	U			250	U D	120	U D	130	U				
108-90-7	**Chlorobenzene**	5	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
75-00-3	**Chloroethane**	5	**20**		2	U	2	U	2	U	1	U			**6,600**	**D**	**2,400**	**D**	**4,500**					
67-66-3	**Chloroform**	7	8	U	2	U	2	U	2	U	1	U			100	U D	50	U D	130	U				
74-87-3	**Chloromethane**	5	20	U	2	U	2	U	2	U	1	U			100	U D	50	U D	130	U				
156-59-2	**cis-1,2-Dichloroethene (3)**	5	4	U	1	U	1	U	1	U	1	U	**630**		**190**	**D**	25	U D	130	U	**15**		25,000	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	2	U	0.5	U	0.5	U	0.5	U	1	U			25	U D	12	U D	130	U				
10061-02-6	**trans-1,3-Dichloropropene**		2	U	0.5	U	0.5	U	0.5	U	1	U			25	U D	12	U D	130	U				
110-82-7	**Cyclohexane**	NS		U							1	U							130	U				
124-48-1	**Dibromochloromethane**	50(GV)	8	U							1	U							130	U				
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	8	U	2	U	2	U	2	U	1	U			100	U D	50	U D	130	U				
75-09-2	**Dichloromethane**	5																						
64-17-5	**Ethanol (ug/L)**	NS	**910**																					
100-41-4	**Ethyl Benzene**	5	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
98-82-8	**Isopropylbenzene**	5	4	U	2	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
79-20-9	**Methyl Acetate**	NS	4	U (L-04)	1	U	1	U	1	U	2.5	U			50	U D	25	U D	310	U				
1634-04-4	**Methyl tert-butyl ether**	10(GV)	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
108-88-3	**Methylbenzene**	5																						
108-87-2	**Methylcyclohexane**	50	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
75-09-2	**Methylene chloride**	5	20	U	5	U	5	U	5	U	1	U			250	U D	120	U D	130	U				
179601-23-1	**m/p-Xylenes**	5	8	U																				
95-47-6	**o-Xylenes**	5	4	U																				
100-42-5	**Styrene**	5	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U				
127-18-4	**Tetrachloroethene**	5	4	U	1	U	1	U	1	U	1	U	**650**		50	U D	25	U D	130	U	**10**		25,000	U
108-88-3	**Toluene**	5	4	U	1	U	1	U	1	U	1	U			**100**	**D**	25	U D	130	U				
156-60-5	**trans-1,2-Dichloroethene (3)**	5	4	U	1	U	1	U	1	U	1	U			50	U D	25	U D	130	U			25,000	U
79-01-6	**Trichloroethene**	5	4	U	1	U	1	U	1	U	1	U	**450**	**J**	50	U D	25	U D	130	U	**160**		25,000	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	8	U	2	U	2	U	2	U	1	U			100	U D	50	U D	130	U				
75-01-4	**Vinyl chloride**	2	**26**		**36**		**29**		**19**		**7.2**		1,000	U	**260**	**D**	50	U D	130	U	**1**	**J**	50,000	U
	Total detected CVOCs	NS	**195**		**203**		**157**		**95**		**40.3**		**15,240**		**8,850**		**2,832**		**4,630**		**229**		**651,000**	
	Total detected VOCs	NS	**1,305**		**203**		**157**		**95**		**40.3**		**15,240**		**8,950**		**2,832**		**4,630**		**229**		**651,000**	
	Acetic Acid (ug/L)	NS	5,800	U									NA								NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHC-29 (product)		MHC-29		MHC-29		MHC-29		MHC-29 (2)		MHC-29		MHC-29	
	Date		August 1995 (1)		9/8/2005		1/13/2006		4/2/2007		2/24/2011		6/17/2015 (5)		1/6/2016	
	Screen Interval (ft bgs)		10-20		10-20		10-20		10-20		10-20		10-20		10-20	
	Area		Area C		Area C		Area C		Area C		Area C		Area C		Area C	
CAS No.	***VOC (µg/l)***															
71-55-6	**1,1,1-Trichloroethane**	5	**790,000,000**		**1,220,000**		**1,250,000**		**1,100,000**		**1,000,000**		**48,600**		**342,300**	**D**
79-34-5	**1,1,2,2-Tetrachloroethane**	5			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
79-00-5	**1,1,2-Trichloroethane**	1			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
75-34-3	**1,1-Dichloroethane**	5	**24,000,000**	**J**	**197,000**		**250,000**		**220,000**		**190,000**	**D**	**16,100**		**64,000**	
75-35-4	**1,1-Dichloroethene**	5	**330,000,000**		**2,850**		50,000	U	50,000	U	**140,000**	**D**	**260**	**J**	**1,300**	
87-61-6	**1,2,3-Trichlorobenzene**	5							50,000	U			500	U	500	U
120-82-1	**1,2,4-Trichlorobenzene**	5			5,000	U	100,000	U	50,000	U	100	U	500	U	500	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04			5,000	U	100,000	U	50,000	U	100	U	500	U	500	U
106-93-4	**1,2-Dibromoethane**	NS			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
95-50-1	**1,2-Dichlorobenzene**	3			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
107-06-2	**1,2-Dichloroethane**	0.6	25,000	U	**12,800**		50,000	U	50,000	U	**9,100**		**670**		**3,400**	
78-87-5	**1,2-Dichloropropane**	1			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
541-73-1	**1,3-Dichlorobenzene**	3									100	U	500	U	500	U
142-28-9	**1,3-Dichloropropane**	5							50,000	U						
106-46-7	**1,4-Dichlorobenzene**	3			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
123-91-1	**1,4-Dioxane**	0.35											50,000	U	50000	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)			50,000	U	1,000,000	U	50,000	UJ	**380**	**J**	2,500	U	2500	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50			2,500	U	500,000	U	50,000	U	500	U	2,500	U	2500	U
108-10-1	**4-Methyl-2-pentanone**	NS			25,000	U	500,000	U	50,000	U	500	U	2,500	U	2500	U
67-64-1	**Acetone**	50 (GV)			50,000	U	1,000,000	U	50,000	UJ	**1,700**		2,500	U	**630**	**J**
71-43-2	**Benzene**	1			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
74-97-5	**Bromochloromethane**	5											500	U	500	U
75-27-4	**Bromodichloromethane**	50(GV)			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
75-25-2	**Bromoform**	50(GV)									100	U	500	U	500	U
74-83-9	**Bromomethane**	5			5,000	U	100,000	U	50,000	U	100	U	500	U	500	U
75-15-0	**Carbon Disulfide**	NS			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
56-23-5	**Carbon Tetrachloride**	5			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
108-90-7	**Chlorobenzene**	5			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
75-00-3	**Chloroethane**	5			5,000	U	100,000	U	50,000	U	100	U	500	U	**3,600**	
67-66-3	**Chloroform**	7			**700**	**J**	50,000	U	50,000	U	100	U	500	U	**130**	**J**
74-87-3	**Chloromethane**	5			5,000	U	100,000	U	50,000	U	100	U	500	U	**210**	**J**
156-59-2	**cis-1,2-Dichloroethene (3)**	5	25,000	U	2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
10061-02-6	**trans-1,3-Dichloropropene**				2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
110-82-7	**Cyclohexane**	NS			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
124-48-1	**Dibromochloromethane**	50(GV)			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5			5,000	U	100,000	U	50,000	U	100	U	500	U	500	U
75-09-2	**Dichloromethane**	5			10,000	U	200,000	U	50,000	U						
64-17-5	**Ethanol (ug/L)**	NS														
100-41-4	**Ethyl Benzene**	5			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
98-82-8	**Isopropylbenzene**	5			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
79-20-9	**Methyl Acetate**	NS			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
108-88-3	**Methylbenzene**	5			2,500	U	50,000	U	50,000	U						
108-87-2	**Methylcyclohexane**	50			2,500	U	50,000	U			100	U	500	U	500	U
75-09-2	**Methylene chloride**	5									100	U	500	U	500	U
179601-23-1	**m/p-Xylenes**	5			5,000	U	100,000	U	50,000	U	200	U	1,000	U	1,000	U
95-47-6	**o-Xylenes**	5			5,000	U	100,000	U	50,000	U	200	U	500	U	500	U
100-42-5	**Styrene**	5			2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
127-18-4	**Tetrachloroethene**	5	25,000	U	2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
108-88-3	**Toluene**	5									100	U	500	U	500	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	25,000	U	2,500	U	50,000	U	50,000	U	100	U	500	U	500	U
79-01-6	**Trichloroethene**	5	25,000	U	**1,100**	**J**	50,000	U	50,000	U	**1,500**		500	U	**190**	**J**
75-69-4	**Trichlorofluoromethane (CFC-11)**	5			5,000	U	100,000	U	50,000	U	100	U	500	U	500	U
75-01-4	**Vinyl chloride**	2		U	5,000	U	100,000	U	50,000	U	**460**		500	U	500	U
	Total detected CVOCs	NS	**1,144,000,000**		**1,434,450**		**1,500,000**		**1,320,000**		**1,341,060**		**65,630**		**415,000**	
	Total detected VOCs	NS	**1,144,000,000**		**1,434,450**		**1,500,000**		**1,320,000**		**1,343,140**		**65,630**		**415,760**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHC-29		MHC-29		MHC-29		MHC-29		MHC-29		MHC-29		MHC-29		MHC-29		MHC-29		MHC-29		MHC-29	
	Date		3/9/2016		5/1/2016		7/19/2016		9/23/2016		12/16/2016		2/8/2017		4/7/2017		7/13/2017		1/26/2018		5/22/2018		6/6/2019	
	Screen Interval (ft bgs)		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20		10-20	
	Area		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C	
CAS No.	VOC (µg/l)																							
71-55-6	1,1,1-Trichloroethane	5	558,200	D	302,200	D	260,000		5,600		50	U	10	U	10	U	5	U	1	U	1	U	1	U
79-34-5	1,1,2,2-Tetrachloroethane	5	1,000	U	20	U	1,000	U	120	U	25	U	5	U	5	U	2.5	U	0.5	U	0.5	U	0.5	U
79-00-5	1,1,2-Trichloroethane	1	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
75-34-3	1,1-Dichloroethane	5	98,700		66,800	D	240,000		27,000		2600		670		500		230		5.8		8.6		12	
75-35-4	1,1-Dichloroethene	5	2,200		2,100		23,000		8,200		2900		880		540		150		2.6		2.4		1.8	
87-61-6	1,2,3-Trichlorobenzene	5	1,000	U	20	U	10,000	U	1,200	U	250	U(V-05)	50	U	50	U	25	U						
120-82-1	1,2,4-Trichlorobenzene	5	1,000	U	20	U	2,000	U	250	U	50	U(V-05)	10	U	20	U	5	U	1	U	1	U	1	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	1,000	U	20	U	10,000	U	1,200	U	250	U	50	U	50	U	25	U	5	U	5	U	5	U V-05
106-93-4	1,2-Dibromoethane	NS	1,000	U	20	U	1,000	U	120	U	25	U	5	U	5	U	2.5	U	0.5	U	0.5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	3	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
107-06-2	1,2-Dichloroethane	0.6	5,900		5,100		13,000		1,200		190		16		18		16		1	U	1	U	1	U
78-87-5	1,2-Dichloropropane	1	1,000	U	23	J	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
541-73-1	1,3-Dichlorobenzene	3	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1.2		1	U	1	U
142-28-9	1,3-Dichloropropane	5					1,000	U	120	U	25	U	5	U	5	U	2.5	U						
106-46-7	1,4-Dichlorobenzene	3	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
123-91-1	1,4-Dioxane	0.35	100,000	U	10000	U	100,000	U (V-05)	12,000	U (V-05)	2,500	U	500	U	500	U	250	U						
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	5,000	U	250	U	40,000	U	5,000	U	1,000	U	200	U	200	U	100	U	91		20	U	20	U
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	5,000	U	250	U	20,000	U	2,500	U	500	U	100	U	100	U	50	U	16		10	U	10	U
108-10-1	4-Methyl-2-pentanone	NS	5,000	U	100	U	20,000	U	2,500	U	500	U	100	U	100	U	50	U	10	U	10	U	10	U
67-64-1	Acetone	50 (GV)	5,000	U	1,100		100,000	U	12,000	U	2,500	U	530		500	U	320		820		50	U	50	U
71-43-2	Benzene	1	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
74-97-5	Bromochloromethane	5	1,000	U	50	U	2,000	U	250	U	50	U	10	U	10	U	5	U						
75-27-4	Bromodichloromethane	50(GV)	1,000	U	20	U	1,000	U	120	U	25	U	10	U	5	U	2.5	U	0.5	U	0.5	U	0.5	U
75-25-2	Bromoform	50(GV)	1,000	U	20	U	4,000	U	250	U	50	U	10	U	10	U	10	U	1	U	1	U	1	U
74-83-9	Bromomethane	5	1,000	U	20	U	4,000	U	500	U	100	U	20	U(R-05)	20	U(R-05)	25	U	2	U	2	U	5	U
75-15-0	Carbon Disulfide	NS	1,000	U	20	U	8,000	U	1,000	U	200	U	40	U	40	U	20	U	4	U	5.9		5	U
56-23-5	Carbon Tetrachloride	5	1,000	U	20	U	10,000	U	1,200	U	250	U	50	U	50	U	25	U	5	U	5	U	5	U
108-90-7	Chlorobenzene	5	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
75-00-3	Chloroethane	5	2,300		4,000		9,700		500	U	100	U	20	U	20	U	25	U	2	U	2	U	2	U
67-66-3	Chloroform	7	280	J	190		4,000	U	500	U	100	U	20	U	20	U	10	U	2	U	2	U	2	U
74-87-3	Chloromethane	5	1,000	U	20	U	4,000	U	500	U	100	U	20	U	20	U	25	U	2	U	2	U	2	U
156-59-2	cis-1,2-Dichloroethene (3)	5	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	7.9		3.5		1.5		1	U
10061-01-5	cis-1,3-Dichloropropene	0.4	1,000	U	20	U	1,000	U	120	U	25	U	5	U	5	U	2.5	U	0.5	U	0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene		1,000	U	20	U	1,000	U	120	U	50	U	5	U	5	U	2.5	U	0.5	U	0.5	U	0.5	U
110-82-7	Cyclohexane	NS	1,000	U	20	U	10,000	U	1,200	U	250	U	50	U	50	U								
124-48-1	Dibromochloromethane	50(GV)	1,000	U	20	U	1,000	U	500	U	25	U	5	U	5	U	10	U						
75-71-8	Dichlorodifluoromethane (cfc-12)	5	1,000	U	20	U	4,000	U (V-05)	500	U	100	U(V-05)	20	U	20	U(V-05)	10	U	2	U	2	U	2	U
75-09-2	Dichloromethane	5																						
64-17-5	Ethanol (ug/L)	NS									2,500	U	500	U (V-05)	1,500		1,100							
100-41-4	Ethyl Benzene	5	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
98-82-8	Isopropylbenzene	5	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	2	U	1	U	1	U
79-20-9	Methyl Acetate	NS	1,000	U	50	U	10,000	U	250	U (V-05)	50	U	20	U	10	U(L-04)	5	U(L-04)	11		1	U	1	U
1634-04-4	Methyl tert-butyl ether	10(GV)	1,000	U	50	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
108-88-3	Methylbenzene	5																						
108-87-2	Methylcyclohexane	50	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
75-09-2	Methylene chloride	5	1,000	U	20	U	10,000	U	1,200	U	250	U	50	U	50	U	25	U	5	U	5	U	5	U
179601-23-1	m/p-Xylenes	5	2,000	U	40	U	4,000	U	500	U	100	U	20	U	20	U	10	U						
95-47-6	o-Xylenes	5	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U						
100-42-5	Styrene	5	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
127-18-4	Tetrachloroethene	5	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1	U	1	U	1	U
108-88-3	Toluene	5	1,000	U	20	U	2,000	U	250	U	50	U	10	U	10	U	5	U	1		1	U	1	U
156-60-5	trans-1,2-Dichloroethene (3)	5	1,000	U	20	U	2,000	U	250	U	25	U	10	U	10	U	5	U	1	U	1	U	1	U
79-01-6	Trichloroethene	5	320	J	240		2,000	U	250	U	95		50		71		9.8		1.5		1.2		1	U
75-69-4	Trichlorofluoromethane (CFC-11)	5	1,000	U	20	U	4,000	U	500	U	100	U	20	U	20	U	10	U	2	U	2	U	2	U
75-01-4	Vinyl chloride	2	1,000	U	540		4,000	U	500	U	220		210		160		17		2	U	2	U	2	U
	Total detected CVOCs	NS	667,620		381,003		545,700		42,000		6,005		1,826		1,289		430.7		14.6		13.7		13.8	
	Total detected VOCs	NS	667,900		382,293		545,700		42,000		6,005		2,356		2,789		1,851		953.6		19.6		13.8	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		290	U	197,000		2,900	U	9,200	J						

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	MHC-29		MHC-30		MHC-30		MHC-30		MHC-30 (2)		OBG-6S		OBG-7S		OBG-7S	
	Date		11/1/2021		August 1995 (1)		8/31/2005		1/11/2006		2/24/2011		1/11/2006		10/20/2005		1/11/2006	
	Screen Interval (ft bgs)		10-20		9-19		9-19		9-19		9-19		5-10 ft		4.8-9.8		4.8-9.8	
	Area		Area C		Area B		Area B		Area B		Area B		60-ft west of Area B		Area B (vicinity)		Area B (vicinity)	
CAS No.	***VOC (µg/l)***																	
71-55-6	**1,1,1-Trichloroethane**	5	1	U	**900**		**45.5**		**122**		**160**		0.5	U	**0.25**	**J**	0.5	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
75-34-3	**1,1-Dichloroethane**	5	**3.1**		**690**		**850**		**1,830**		**2,200**		0.5	U	**0.1**	**J**	0.5	U
75-35-4	**1,1-Dichloroethene**	5	**0.65**	**J**	**28**		**51**		**114**		**160**		0.5	U	0.5	U	0.5	U
87-61-6	**1,2,3-Trichlorobenzene**	5																
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U			50	U	50	U	50	U	0.5	U	1	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	1	U			50	U	50	U	50	U	1	U	1	U	1	U
106-93-4	**1,2-Dibromoethane**	NS	1	U							50	U						
95-50-1	**1,2-Dichlorobenzene**	3	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
107-06-2	**1,2-Dichloroethane**	0.6	**0.33**	**J**	25	U	**6**	**J**	**19**	**J**	**21**	**J**	0.5	U	0.5	U	0.5	U
78-87-5	**1,2-Dichloropropane**	1	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U							50	U						
142-28-9	**1,3-Dichloropropane**	5																
106-46-7	**1,4-Dichlorobenzene**	3	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
123-91-1	**1,4-Dioxane**	0.35	**2.4**															
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	10	U			500	U	500	U	500	U	10	U	10	U	10	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	5	U			250	U	250	U	250	U	5	U	5	U	5	U
108-10-1	**4-Methyl-2-pentanone**	NS	5	U			250	U	250	U	250	U	5	U	5	U	5	U
67-64-1	**Acetone**	50 (GV)	10	U			500	U	500	U	500	U	10	U	**1.8**	**J**	10	U
71-43-2	**Benzene**	1	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
74-97-5	**Bromochloromethane**	5																
75-27-4	**Bromodichloromethane**	50(GV)	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
75-25-2	**Bromoform**	50(GV)	1	U							50	U						
74-83-9	**Bromomethane**	5	1	U			50	U	50	U	50	U	1	U	1	U	1	U
75-15-0	**Carbon Disulfide**	NS	1	U			25	U	25	U	50	U	0.5	U	**0.2**	**J**	**0.14**	**J**
56-23-5	**Carbon Tetrachloride**	5	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
108-90-7	**Chlorobenzene**	5	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
75-00-3	**Chloroethane**	5	**1.6**				50	U	50	U	50	U	1	U	1	U	1	U
67-66-3	**Chloroform**	7	1	U			25	U	25	U	50	U	0.5	U	1	U	1	U
74-87-3	**Chloromethane**	5	1	U			50	U	50	U	50	U	1	U	0.5	U	0.5	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	**1.4**		25	U	25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
10061-02-6	**trans-1,3-Dichloropropene**		1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
110-82-7	**Cyclohexane**	NS	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
124-48-1	**Dibromochloromethane**	50(GV)	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	1	U			50	U	50	U	50	U	1	U	1	U	1	U
75-09-2	**Dichloromethane**	5					**11.5**	**J**	100	U			2	U	2	UJ	2	UJ
64-17-5	**Ethanol (ug/L)**	NS																
100-41-4	**Ethyl Benzene**	5	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
98-82-8	**Isopropylbenzene**	5	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
79-20-9	**Methyl Acetate**	NS	2.5	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	**0.22**	**J**			25	U	**12.5**	**J**	50	U	0.5	U	0.5	U	0.5	U
108-88-3	**Methylbenzene**	5					25	U	25	U			0.5	U	0.5	U	0.5	U
108-87-2	**Methylcyclohexane**	50	1	U							50	U						
75-09-2	**Methylene chloride**	5	1	U							50	U						
179601-23-1	**m/p-Xylenes**	5					50	U	50	U	100	U	1	U	1	U	1	U
95-47-6	**o-Xylenes**	5					50	U	50	U	100	U	1	U	1	U	1	U
100-42-5	**Styrene**	5	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
127-18-4	**Tetrachloroethene**	5	1	U	25	U	25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
108-88-3	**Toluene**	5	1	U							50	U						
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U			25	U	25	U	50	U	0.5	U	0.5	U	0.5	U
79-01-6	**Trichloroethene**	5	1	U	25	U	25	U	**14.0**	**J**	50	U	0.5	U	0.5	U	0.5	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	1	U			50	U	50	U	50	U	1	U	1	U	1	U
75-01-4	**Vinyl chloride**	2	1	U	50	U	50	U	50	U	50	U	1	U	1	U	1	U
	Total detected CVOCs	NS	**7.08**		**1,618**		**964**		**2,099**		**2,541**		**ND**		**0.35**		**ND**	
	Total detected VOCs	NS	**7.3**		**1,618**		**964**		**2,112**		**2,541**		**ND**		**2.34**		**0.14**	
	Acetic Acid (ug/L)	NS			NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	OBG-7S		OBG-7S		OBG-7S		OBG-7S		OBG-7S		OBG-7S		OBG-7S	
	Date		12/7/2012		6/18/2015 (5)		1/5/2016		3/9/2016		5/4/2016		7/20/2016		9/21/2016	
	Screen Interval (ft bgs)		4.8-9.8		4.8-9.8		4.8-9.8		4.8-9.8		4.8-9.8		4.8-9.8		4.8-9.8	
	Area		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)	
CAS No.	*VOC (µg/l)*															
71-55-6	**1,1,1-Trichloroethane**	5	1	U	**65**		1	U	1	U	0.2	U	1	U	1	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	0.5	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
75-34-3	**1,1-Dichloroethane**	5	1	U	**4.4**		1	U	1	U	0.2	U	1	U	1	U
75-35-4	**1,1-Dichloroethene**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
87-61-6	**1,2,3-Trichlorobenzene**	5			1	U	1	U	1	U	0.2	U	5	U	5	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	1	U	1	U	1	U	1	U	0.2	U	5	U	5	U
106-93-4	**1,2-Dibromoethane**	NS	1	U	1	U	1	U	1	U	0.2	U	1	U	0.5	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
78-87-5	**1,2-Dichloropropane**	1	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
142-28-9	**1,3-Dichloropropane**	5											1	U	0.5	U
106-46-7	**1,4-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
123-91-1	**1,4-Dioxane**	0.35			100	U	100	U	100	U	100	U	50	U (V-05)	50	U (V-05)
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	10	U	5	U	5	U	5	U	2.5	U	20	U	20	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	5	U	5	U	5	U	5	U	2.5	U	10	U	10	U
108-10-1	**4-Methyl-2-pentanone**	NS	5	U	5	U	5	U	5	U	1	U	10	U	10	U
67-64-1	**Acetone**	50 (GV)	10	U	5	U	5	U	5	U	1	U	50	U	50	U
71-43-2	**Benzene**	1	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
74-97-5	**Bromochloromethane**	5			1	U	1	U	1	U	0.5	U	1	U	1	U
75-27-4	**Bromodichloromethane**	50(GV)	1	U	1	U	1	U	1	U	0.2	U	1	U	0.5	U
75-25-2	**Bromoform**	50(GV)	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U
74-83-9	**Bromomethane**	5	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U
75-15-0	**Carbon Disulfide**	NS	1	U	1	U	**0.28**	**J**	1	U	0.2	U	4	U	4	U
56-23-5	**Carbon Tetrachloride**	5	1	U	1	U	1	U	1	U	0.2	U	5	U	5	U
108-90-7	**Chlorobenzene**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
75-00-3	**Chloroethane**	5	1	U	1	U	1	U	1	U	0.5	U	2	U	2	U
67-66-3	**Chloroform**	7	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U
74-87-3	**Chloromethane**	5	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1	U	1	U	1	U	1	U	0.2	U	1	U	0.5	U
10061-02-6	**trans-1,3-Dichloropropene**		1	U	1	U	1	U	1	U	0.2	U	1	U	0.5	U
110-82-7	**Cyclohexane**	NS	1	U	1	U	1	U	1	U	0.2	U	5	U	5	U
124-48-1	**Dibromochloromethane**	50(GV)	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	1	U	1	U	1	U	1	U	0.2	U	2	U (V-05)	2	U
75-09-2	**Dichloromethane**	5														
64-17-5	**Ethanol (ug/L)**	NS														
100-41-4	**Ethyl Benzene**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
98-82-8	**Isopropylbenzene**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
79-20-9	**Methyl Acetate**	NS	1	U	1	U	1	U	1	U	0.5	U	5	U	5	U (V-05)
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1	U	1	U	1	U	1	U	0.5	U	1	U	1	U
108-88-3	**Methylbenzene**	5														
108-87-2	**Methylcyclohexane**	50	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
75-09-2	**Methylene chloride**	5	1	U	1	U	1	U	1	U	0.2	U	5	U	5	U
179601-23-1	**m/p-Xylenes**	5	1	U	2	U	2	U	2	U	0.4	U	2	U	2	U
95-47-6	**o-Xylenes**	5	2	U	1	U	1	U	1	U	0.2	U	1	U	1	U
100-42-5	**Styrene**	5	2	U	1	U	1	U	1	U	0.2	U	1	U	1	U
127-18-4	**Tetrachloroethene**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
108-88-3	**Toluene**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
79-01-6	**Trichloroethene**	5	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U
75-01-4	**Vinyl chloride**	2	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U
	Total detected CVOCs	NS	**ND**		**69.40**		**ND**		**ND**		**ND**		**ND**		**ND**	
	Total detected VOCs	NS	**ND**		**69.40**		**0.28**		**ND**		**ND**		**ND**		**ND**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	OBG-7S		OBG-7S		OBG-7S		OBG-7S		OBG-7S		OBG-7S		OBG-7S	
	Date		12/15/2016		2/6/2017		4/10/2017		7/12/2017		5/22/2018		6/6/2019		11/1/2021	
	Screen Interval (ft bgs)		4.8-9.8		4.8-9.8		4.8-9.8		4.8-9.8		4.8-9.8		4.8-9.8		4.8-9.8	
	Area		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)	
CAS No.	*VOC (µg/l)*															
71-55-6	**1,1,1-Trichloroethane**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	1	U	1	U	1	U	1	U	1	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-34-3	**1,1-Dichloroethane**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-35-4	**1,1-Dichloroethene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
87-61-6	**1,2,3-Trichlorobenzene**	5	5	U	5	U	5	U	5	U						
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	5	U	5	U	5	U	5	U	5	U	5	U V-05	1	U
106-93-4	**1,2-Dibromoethane**	NS	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	1	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	1	U	1	U	1	U	2	U	1	U	1	U	1	U
78-87-5	**1,2-Dichloropropane**	1	1	U	1	U	1	U	1	U	1	U	1	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	1	U	1	U
142-28-9	**1,3-Dichloropropane**	5	1	U	0.5	U	0.5	U	0.5	U						
106-46-7	**1,4-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	1	U	1	U
123-91-1	**1,4-Dioxane**	0.35	50	U	50	U	50	U	50	U					0.1	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	20	U	20	U	20	U	20	U	20	U	20	U	10	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	10	U	10	U	10	U	10	U	10	U	10	U	5	U
108-10-1	**4-Methyl-2-pentanone**	NS	10	U	10	U	10	U	10	U	10	U	10	U	5	U
67-64-1	**Acetone**	50 (GV)	50	U	50	U	**53**		50	U	50	U	50	U	10	U
71-43-2	**Benzene**	1	1	U	1	U	1	U	1	U	1	U	1	U	1	U
74-97-5	**Bromochloromethane**	5	1	U	1	U	1	U	1	U						
75-27-4	**Bromodichloromethane**	50(GV)	1	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
75-25-2	**Bromoform**	50(GV)	1	U	1	U	2	U	2	U	1	U	1	U	1	U
74-83-9	**Bromomethane**	5	2	U	2	U	5	U(L-04)	5	U	2	U	5	U	1	U
75-15-0	**Carbon Disulfide**	NS	4	U	4	U	4	U	4	U	4	U	5	U	1	U
56-23-5	**Carbon Tetrachloride**	5	5	U	5	U	5	U	5	U	5	U	5	U	1	U
108-90-7	**Chlorobenzene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-00-3	**Chloroethane**	5	2	U	2	U	2	U	5	U	2	U	2	U	1	U
67-66-3	**Chloroform**	7	2	U	2	U	2	U(V-05,L-04)	2	U	2	U	2	U	1	U
74-87-3	**Chloromethane**	5	2	U	2	U	2	U	5	U	2	U	2	U	1	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
10061-02-6	**trans-1,3-Dichloropropene**		1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
110-82-7	**Cyclohexane**	NS	5	U	5	U	5	U							1	U
124-48-1	**Dibromochloromethane**	50(GV)	1	U	0.5	U	1	U	2	U					1	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	2	U (V-05)	2	U	2	U(L-04)	2	U	2	U	2	U	1	U
75-09-2	**Dichloromethane**	5														
64-17-5	**Ethanol (ug/L)**	NS	50	U	50	U (V-05)	50	U	50	U						
100-41-4	**Ethyl Benzene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
98-82-8	**Isopropylbenzene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
79-20-9	**Methyl Acetate**	NS	1	U	2	U	1	U(L-04)	1	U(L-04)	1	U	1	U	2.5	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1	U	1	U	1	U	1	U	1	U	1	U	1	U
108-88-3	**Methylbenzene**	5														
108-87-2	**Methylcyclohexane**	50	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-09-2	**Methylene chloride**	5	5	U	5	U	5	U	5	U	5	U	5	U	1	U
179601-23-1	**m/p-Xylenes**	5	2	U	2	U	2	U	2	U						
95-47-6	**o-Xylenes**	5	1	U	1	U	1	U	1	U						
100-42-5	**Styrene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
127-18-4	**Tetrachloroethene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
108-88-3	**Toluene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
79-01-6	**Trichloroethene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	2	U	2	U	2	U	2	U	2	U	2	U	1	U
75-01-4	**Vinyl chloride**	2	2	U	2	U	2	U	2	U	2	U	2	U	1	U
	Total detected CVOCs	NS	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	Total detected VOCs	NS	**ND**		**ND**		**53**		**ND**		**ND**		**ND**		**ND**	
	Acetic Acid (ug/L)	NS	290	U	290	U	290	U	5,800	U						

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	OBG-7I		OBG-7I		OBG-7I		OBG-7I		OBG-7I		OBG-7I		OBG-7I	
	Date		10/20/2005		1/11/2006		2/24/2011		6/18/2015 (5)		1/5/2016		3/9/2016		5/3/2016	
	Screen Interval (ft bgs)		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4	
	Area		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)	
CAS No.	***VOC (µg/l)***															
71-55-6	**1,1,1-Trichloroethane**	5	**1.54**		**0.23**	**J**	1.0	U	1	U	1	U	1	U	0.2	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
79-00-5	**1,1,2-Trichloroethane**	1	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
75-34-3	**1,1-Dichloroethane**	5	**0.4**	**J**		U	1.0	U	1	U	**0.76**	**J**	1	U	0.2	U
75-35-4	**1,1-Dichloroethene**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
87-61-6	**1,2,3-Trichlorobenzene**	5							1	U	1	U	1	U	0.2	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U	1.0	U	1	U	1	U	1	U	0.2	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	1	U	1	U	1.0	U	1	U	1	U	1	U	0.2	U
106-93-4	**1,2-Dibromoethane**	NS					1.0	U	1	U	1	U	1	U	0.2	U
95-50-1	**1,2-Dichlorobenzene**	3	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
107-06-2	**1,2-Dichloroethane**	0.6	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
78-87-5	**1,2-Dichloropropane**	1	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
541-73-1	**1,3-Dichlorobenzene**	3					1.0	U	1	U	1	U	1	U	0.2	U
142-28-9	**1,3-Dichloropropane**	5							1	U						
106-46-7	**1,4-Dichlorobenzene**	3	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
123-91-1	**1,4-Dioxane**	0.35							100	U	100	U	100	U	100	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	**5.53**	**J**	**3.49**	J	10.0	U	5	U	5	U	5	U	2.5	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	5	U	5	U	5.0	U	5	U	5	U	5	U	2.5	U
108-10-1	**4-Methyl-2-pentanone**	NS	5	U	5	U	5.0	U	5	U	5	U	5	U	1	U
67-64-1	**Acetone**	50 (GV)	**12.10**		**7.5**	J	10.0	U	5	U	5	U	5	U	1	U
71-43-2	**Benzene**	1	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
74-97-5	**Bromochloromethane**	5							1	U	1	U	1	U	0.5	U
75-27-4	**Bromodichloromethane**	50(GV)	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
75-25-2	**Bromoform**	50(GV)					1.0	U	1	U	1	U	1	U	0.2	U
74-83-9	**Bromomethane**	5	1	U	1	U	1.0	U	1	U	1	U	1	U	0.2	U
75-15-0	**Carbon Disulfide**	NS	**0.31**	**J**	**2.3**		1.0	U	1	U	1	U	1	U	0.2	U
56-23-5	**Carbon Tetrachloride**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
108-90-7	**Chlorobenzene**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
75-00-3	**Chloroethane**	5	1	U	1	U	1.0	U	1	U	1	U	1	U	0.5	U
67-66-3	**Chloroform**	7	**1.7**		**0.9**		1.0	U	1	U	1	U	1	U	0.2	U
74-87-3	**Chloromethane**	5	1	U	1	U	1.0	U	1	U	**0.3**	**J**	1	U	0.2	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
10061-02-6	**trans-1,3-Dichloropropene**		0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
110-82-7	**Cyclohexane**	NS	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
124-48-1	**Dibromochloromethane**	50(GV)	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	1	U	1	U	1.0	U	1	U	1	U	1	U	0.2	U
75-09-2	**Dichloromethane**	5	2	UJ	**0.42**	**J**										
64-17-5	**Ethanol (ug/L)**	NS														
100-41-4	**Ethyl Benzene**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
98-82-8	**Isopropylbenzene**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
79-20-9	**Methyl Acetate**	NS	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.5	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.5	U
108-88-3	**Methylbenzene**	5	**0.14**	**J**	**0.18**	**J**										
108-87-2	**Methylcyclohexane**	50					1.0	U	1	U	1	U	1	U	0.2	U
75-09-2	**Methylene chloride**	5					1.0	U	1	U	1	U	1	U	0.2	U
179601-23-1	**m/p-Xylenes**	5	1	U	1	U	1.0	U	2	U	2	U	2	U	0.4	U
95-47-6	**o-Xylenes**	5	1	U	1	U	2.0	U	1	U	1	U	1	U	0.2	U
100-42-5	**Styrene**	5	0.5	U	0.5	U	2.0	U	1	U	1	U	1	U	0.2	U
127-18-4	**Tetrachloroethene**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
108-88-3	**Toluene**	5					1.0	U	1	U	1	U	1	U	0.2	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
79-01-6	**Trichloroethene**	5	0.5	U	0.5	U	1.0	U	1	U	1	U	1	U	0.2	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	1	U	1	U	1.0	U	1	U	1	U	1	U	0.2	U
75-01-4	**Vinyl chloride**	2	1	U	1	U	1.0	U	1	U	1	U	1	U	0.2	U
	Total detected CVOCs	NS	**4**		**2.94**		**ND**		**ND**		**1.06**		**ND**		**ND**	
	Total detected VOCs	NS	**22.15**		**15.05**		**ND**		**ND**		**1.06**		**ND**		**ND**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	OBG-7I		OBG-7I		OBG-7I		OBG-7I		OBG-7I		OBG-7I		OBG-7I		OBG-7I		OBG-7I	
	Date		7/20/2016		9/21/2016		12/14/2016		2/6/2017		4/7/2017		7/12/2017		5/22/2018		6/6/2019		11/1/2021	
	Screen Interval (ft bgs)		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4		19.4-29.4	
	Area		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)	
CAS No.	***VOC (µg/l)***																			
71-55-6	**1,1,1-Trichloroethane**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-34-3	**1,1-Dichloroethane**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-35-4	**1,1-Dichloroethene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
87-61-6	**1,2,3-Trichlorobenzene**	5	5	U	5	U	5	U	5	U	5	U	5	U						
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U V-05	1	U
106-93-4	**1,2-Dibromoethane**	NS	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	1	U	1	U	1	U	1	U	1	U	2	U	1	U	1	U	1	U
78-87-5	**1,2-Dichloropropane**	1	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
142-28-9	**1,3-Dichloropropane**	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U						
106-46-7	**1,4-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
123-91-1	**1,4-Dioxane**	0.35	50	U (V-05)	50	U (V-05)	50	U	50	U	50	U	50	U					0.1	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	10	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5	U
108-10-1	**4-Methyl-2-pentanone**	NS	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5	U
67-64-1	**Acetone**	50 (GV)	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	10	U
71-43-2	**Benzene**	1	1	U	1	U	1	U	10	U	1	U	1	U	1	U	1	U	1	U
74-97-5	**Bromochloromethane**	5	1	U	1	U	1	U	1	U	1	U	1	U						
75-27-4	**Bromodichloromethane**	50(GV)	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
75-25-2	**Bromoform**	50(GV)	2	U	2	U	1	U	1	U	2	U	2	U	1	U	1	U	1	U
74-83-9	**Bromomethane**	5	2	U	2	U	2	U	2	U	5	U(L-04)	5	U	2	U	5	U	1	U
75-15-0	**Carbon Disulfide**	NS	4	U	4	U	4	U	4	U	4	U	4	U	4	U	5	U	1	U
56-23-5	**Carbon Tetrachloride**	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	1	U
108-90-7	**Chlorobenzene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-00-3	**Chloroethane**	5	2	U	2	U	2	U	2	U	2	U	5	U	2	U	2	U	1	U
67-66-3	**Chloroform**	7	2	U	2	U	2	U	2	U	2	U(L-04, V-05)	2	U	2	U	2	U	1	U
74-87-3	**Chloromethane**	5	2	U	2	U	2	U	2	U	2	U	5	U	2	U	2	U	1	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
10061-02-6	**trans-1,3-Dichloropropene**		0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U
110-82-7	**Cyclohexane**	NS	5	U	5	U	5	U	5	U	5	U							1	U
124-48-1	**Dibromochloromethane**	50(GV)	0.5	U	0.5	U	0.5	U	0.5	U	1	U	2	U					1	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	2	U (V-05)	2	U	2	U (V-05)	2	U	2	U(L-04)	2	U	2	U	2	U	1	U
75-09-2	**Dichloromethane**	5																		
64-17-5	**Ethanol (ug/L)**	NS					50	U	50	U (V-05)	50	U	50	U						
100-41-4	**Ethyl Benzene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
98-82-8	**Isopropylbenzene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
79-20-9	**Methyl Acetate**	NS	5	U	5	U (V-05)	1	U	2	U	1	U(L-04)	1	U(L-04)	1	U	1	U	2.5	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
108-88-3	**Methylbenzene**	5																		
108-87-2	**Methylcyclohexane**	50	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-09-2	**Methylene chloride**	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	1	U
179601-23-1	**m/p-Xylenes**	5	2	U	2	U	2	U	2	U	2	U	2	U						
95-47-6	**o-Xylenes**	5	1	U	1	U	1	U	1	U	1	U	1	U						
100-42-5	**Styrene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
127-18-4	**Tetrachloroethene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
108-88-3	**Toluene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U	1	U	1	U
79-01-6	**Trichloroethene**	5	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	1	U
75-01-4	**Vinyl chloride**	2	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	1	U
	Total detected CVOCs	NS	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	Total detected VOCs	NS	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	Acetic Acid (ug/L)	NS	NA		NA		5,800	U	290	U	290	U	5,800	U						

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	OBG-7D		OBG-7D		OBG-7D		OBG-7D		OBG-7D		OBG-7D		OBG-7D		OBG-7D		OBG-7D		OBG-7D		OBG-7D		OBG-7D	
	Date		3/30/2007		12/7/2012		6/18/2015 (5)		1/5/2016		3/9/2016		5/4/2016		7/20/2016		9/21/2016		12/14/2016		2/6/2017		4/7/2017		7/12/2017	
	Screen Interval (ft bgs)		52-61.5		52-61.5		52-61.5		52-61.5		52-61.5		52-61.5		52-61.5		52-61.5		52-61.5		52-61.5		52-61.5		52-61.5	
	Area		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)	
CAS No.	***VOC (µg/l)***																									
71-55-6	**1,1,1-Trichloroethane**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
79-00-5	**1,1,2-Trichloroethane**	1	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
75-34-3	**1,1-Dichloroethane**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
75-35-4	**1,1-Dichloroethene**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
87-61-6	**1,2,3-Trichlorobenzene**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U	5	U	5	U
120-82-1	**1,2,4-Trichlorobenzene**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	5	U	1	U	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U	5	U	5	U
106-93-4	**1,2-Dibromoethane**	NS	5	U	1	U	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
95-50-1	**1,2-Dichlorobenzene**	3	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	2	U
78-87-5	**1,2-Dichloropropane**	1	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3			1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
142-28-9	**1,3-Dichloropropane**	5	5	U											0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
106-46-7	**1,4-Dichlorobenzene**	3	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
123-91-1	**1,4-Dioxane**	0.35					100	U	100	U	100	U	100	U	50	U (V-05)	50	U (V-05)	50	U	50	U	50	U	50	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	5	UJ	10	U	5	U	5	U	5	U	2.5	U	20	U	20	U	20	U	20	U	20	U	20	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	5	U	5	U	5	U	5	U	5	U	2.5	U	10	U	10	U	10	U	10	U	10	U	10	U
108-10-1	**4-Methyl-2-pentanone**	NS	5	U	5	U	5	U	5	U	5	U	1	U	10	U	10	U	10	U	10	U	10	U	10	U
67-64-1	**Acetone**	50 (GV)	5	UJ	10	U	5	U	**1.50**	**J**	5	U	1	U	50	U	50	U	50	U	50	U	50	U	50	U
71-43-2	**Benzene**	1	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
74-97-5	**Bromochloromethane**	5					1	U	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U	1	U	1	U
75-27-4	**Bromodichloromethane**	50(GV)	5	U	1	U	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U
75-25-2	**Bromoform**	50(GV)			1	U	1	U	1	U	1	U	0.2	U	2	U	2	U	1	U	1	U	2	U	2	U
74-83-9	**Bromomethane**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	5	U (L-04)	5	U
75-15-0	**Carbon Disulfide**	NS	5	U	1	U	1	U	**0.30**	**J**	1	U	0.2	U	4	U	4	U	4	U	4	U	4	U	4	U
56-23-5	**Carbon Tetrachloride**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U	5	U	5	U
108-90-7	**Chlorobenzene**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
75-00-3	**Chloroethane**	5	5	U	1	U	1	U	1	U	1	U	0.5	U	2	U	2	U	2	U	2	U	2	U	2	U
67-66-3	**Chloroform**	7	5	U	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	2	U (V-05, L-04)	2	U
74-87-3	**Chloromethane**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	2	U	5	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	5	U	1	U	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
10061-02-6	**trans-1,3-Dichloropropene**		5	U	1	U	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	0.5	U
110-82-7	**Cyclohexane**	NS	5	U	1	U	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U	5	U		
124-48-1	**Dibromochloromethane**	50(GV)	5	U	1	U	1	U	1	U	1	U	0.2	U	0.5	U	0.5	U	0.5	U	0.5	U	1	U	1	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	2	U (V-05)	2	U	2	U (V-05)	2	U	2	U (L-04)	2	U
75-09-2	**Dichloromethane**	5	5	U																						
64-17-5	**Ethanol (ug/L)**	NS																	50	U	50	U (V-05)	50	U	50	U
100-41-4	**Ethyl Benzene**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
98-82-8	**Isopropylbenzene**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
79-20-9	**Methyl Acetate**	NS	5	U	1	U	1	U	1	U	1	U	0.5	U	5	U	5	U (V-05)	1	U	2	U	1	U (L-04)	1	U(L-04)
1634-04-4	**Methyl tert-butyl ether**	10(GV)	**17**		1	U	1	U	1	U	1	U	0.5	U	1	U	1	U	**13**		1	U	**9.8**		**9.4**	
108-88-3	**Methylbenzene**	5	5	U																						
108-87-2	**Methylcyclohexane**	50			1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
75-09-2	**Methylene chloride**	5			1	U	1	U	1	U	1	U	0.2	U	5	U	5	U	5	U	5	U	5	U	5	U
179601-23-1	**m/p-Xylenes**	5	5	U	1	U	2	U	2	U	2	U	0.4	U	2	U	2	U	2	U	2	U	2	U	2	U
95-47-6	**o-Xylenes**	5	5	U	2	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
100-42-5	**Styrene**	5	5	UJ	2	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
127-18-4	**Tetrachloroethene**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
108-88-3	**Toluene**	5			1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	0.5	U	1	U	1	U	1	U
79-01-6	**Trichloroethene**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	1	U	1	U	1	U	1	U	1	U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	5	U	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	2	U	2	U
75-01-4	**Vinyl chloride**	2	5	U	1	U	1	U	1	U	1	U	0.2	U	2	U	2	U	2	U	2	U	2	U	2	U
	Total detected CVOCs	NS	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**9.8**		**9.4**	
	Total detected VOCs	NS	**17.00**		**ND**		**ND**		**1.8**		**ND**		**ND**		**ND**		**ND**		**13**		**ND**		**9.8**		**9.4**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		NA		290	U	290	U	290	U	5,800	U

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	OBG-70B		OBG-70B		OBG-8S		OBG-8S		OBG-8S		OBG-8S		OBG-8S		OBG-8S		OBG-8S	
	Date		3/29/2007		2/24/2011		9/8/2005		1/12/2006		6/17/2015 (5)		1/6/2016		3/8/2016		5/3/2016		7/19/2016	
	Screen Interval (ft bgs)		69.2-78.8		69.2-78.8		6.1-10.1		6.1-10.1		6.1-10.1		6.1-10.1		6.1-10.1		6.1-10.1		6.1-10.1	
	Area		60-ft west of Area B		60-ft west of Area B		Area B (vicinity)		Area B (vicinity)		Area B (vicinity)		Area A (vicinity)		Area A (vicinity)		Area A (vicinity)		Area A (vicinity)	
CAS No.	*VOC (µg/l)*																			
71-55-6	**1,1,1-Trichloroethane**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	**4**	
79-34-5	**1,1,2,2-Tetrachloroethane**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	0.5	U
79-00-5	**1,1,2-Trichloroethane**	1	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
75-34-3	**1,1-Dichloroethane**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	**1**	
75-35-4	**1,1-Dichloroethene**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
87-61-6	**1,2,3-Trichlorobenzene**	5	5	U							1	U	1	U	1	U	0.2	U	5	U
120-82-1	**1,2,4-Trichlorobenzene**	5	5	U	1	U	1	U	1	U	1	U	1	U	1	U	0.2	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	5	U	1	U	1	U	1	U	1	U	1	U	1	U	0.2	U	5	U
106-93-4	**1,2-Dibromoethane**	NS	5	U	1	U					1	U	1	U	1	U	0.2	U	0.5	U
95-50-1	**1,2-Dichlorobenzene**	3	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
78-87-5	**1,2-Dichloropropane**	1	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3			1	U					1	U	1	U	1	U	0.2	U	1	U
142-28-9	**1,3-Dichloropropane**	5	5	U															0.5	U
106-46-7	**1,4-Dichlorobenzene**	3	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
123-91-1	**1,4-Dioxane**	0.35									100	U	100	U	100	U	100	U	50	U (V-05)
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	5	UJ	10	U	10	U	10	U	5	U	5	U	5	U	2.5	U	20	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U	2.5	U	10	U
108-10-1	**4-Methyl-2-pentanone**	NS	5	U	5	U	5	U	5	U	5	U	5	U	5	U	1	U	10	U
67-64-1	**Acetone**	50 (GV)	**16.0**	**J**	10	U	10	U	10	U	5	U	5	U	5	U	1	U	50	U
71-43-2	**Benzene**	1	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
74-97-5	**Bromochloromethane**	5									1	U	1	U	1	U	0.5	U	1	U
75-27-4	**Bromodichloromethane**	50(GV)	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	0.5	U
75-25-2	**Bromoform**	50(GV)			1	U					1	U	1	U	1	U	0.2	U	2	U
74-83-9	**Bromomethane**	5	5	U	1	U	1	U	1	U	1	U	1	U	1	U	0.2	U	2	U
75-15-0	**Carbon Disulfide**	NS	5	U	1	U	0.15	UJ	0.5	U	1	U	1	U	1	U	0.2	U	4	U
56-23-5	**Carbon Tetrachloride**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	5	U
108-90-7	**Chlorobenzene**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
75-00-3	**Chloroethane**	5	5	U	1	U	1	U	1	U	1	U	1	U	1	U	0.5	U	2	U
67-66-3	**Chloroform**	7	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	2	U
74-87-3	**Chloromethane**	5	5	U	1	U	1	U	1	U	1	U	1	U	1	U	0.2	U	2	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	0.5	U
10061-02-6	**trans-1,3-Dichloropropene**		5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	0.5	U
110-82-7	**Cyclohexane**	NS	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	5	U
124-48-1	**Dibromochloromethane**	50(GV)	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	0.5	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	5	U	1	U	1	U	1	U	1	U	1	U	1	U	0.2	U	2	U (V-05)
75-09-2	**Dichloromethane**	5	5	U			2	U	2	U										
64-17-5	**Ethanol (ug/L)**	NS																		
100-41-4	**Ethyl Benzene**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
98-82-8	**Isopropylbenzene**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
79-20-9	**Methyl Acetate**	NS	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.5	U	5	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	5	U	**2.7**		0.5	U	0.5	U	1	U	1	U	1	U	0.5	U	1	U
108-88-3	**Methylbenzene**	5	5	U			0.5	U	0.5	U										
108-87-2	**Methylcyclohexane**	50			1	U					1	U	1	U	1	U	0.2	U	1	U
75-09-2	**Methylene chloride**	5			1	U					1	U	1	U	1	U	0.2	U	5	U
179601-23-1	**m/p-Xylenes**	5	5	U	2	U	1	U	1	U	2	U	2	U	2	U	0.4	U	2	U
95-47-6	**o-Xylenes**	5	5	U	2	U	1	U	1	U	1	U	1	U	1	U	0.2	U	1	U
100-42-5	**Styrene**	5	5	UJ	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
127-18-4	**Tetrachloroethene**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
108-88-3	**Toluene**	5			1	U					1	U	1	U	1	U	0.2	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
79-01-6	**Trichloroethene**	5	5	U	1	U	0.5	U	0.5	U	1	U	1	U	1	U	0.2	U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	5	U	1	U	1	U	1	U	1	U	1	U	1	U	0.2	U	2	U
75-01-4	**Vinyl chloride**	2	5	U	1	U	1	U	1	U	1	U	1	U	1	U	0.2	U	2	U
	Total detected CVOCs	NS	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**5**	
	Total detected VOCs	NS	**16.00**		**2.7**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**5**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	OBG-8S		OBG-8S		OBG-8S		OBG-8S		OBG-8S		SOG A-2		SOG A-2	
	Date		9/21/2016		12/16/2016		2/6/2017		4/7/2017		7/13/2017		1/6/2016		3/8/2016	
	Screen Interval (ft bgs)		6.1-10.1		6.1-10.1		6.1-10.1		6.1-10.1		6.1-10.1		8.5-23		8.5-23	
	Area		Area A (vicinity)		Area A (vicinity)		Area A (vicinity)		Area A (vicinity)		Area A (vicinity)		Area A		Area A	
CAS No.	***VOC (µg/l)***															
71-55-6	**1,1,1-Trichloroethane**	5	1	U	1	U	1	U	1	U	1	U	**17.5**	**J**	100	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	50	U	100	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	1	U	1	U	1	U	1	U	50	U	100	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
75-34-3	**1,1-Dichloroethane**	5	1	U	1	U	1	U	1	U	1	U	**31,700**	**D**	**65,900**	**D,EB2**
75-35-4	**1,1-Dichloroethene**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
87-61-6	**1,2,3-Trichlorobenzene**	5	5	U	5	U	5	U	5	U	5	U	50	U	100	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	5	U	5	U	5	U	5	U	5	U	50	U	100	U
106-93-4	**1,2-Dibromoethane**	NS	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	50	U	100	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	50	U	100	U
107-06-2	**1,2-Dichloroethane**	0.6	1	U	1	U	1	U	1	U	2	U	**6,300**		**11,300**	**EB2**
78-87-5	**1,2-Dichloropropane**	1	1	U	1	U	1	U	1	U	1	U	50	U	100	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	50	U	100	U
142-28-9	**1,3-Dichloropropane**	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U				
106-46-7	**1,4-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	50	U	100	U
123-91-1	**1,4-Dioxane**	0.35	50	U (V-05)	50	U	50	U	50	U	50	U	5,000	U	10,000	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	20	U	20	U	20	U	20	U	20	U	250	U	500	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	10	U	10	U	10	U	10	U	10	U	250	U	500	U
108-10-1	**4-Methyl-2-pentanone**	NS	10	U	10	U	10	U	10	U	10	U	250	U	500	U
67-64-1	**Acetone**	50 (GV)	50	U	50	U	50	U	50	U	50	U	250	U	500	U
71-43-2	**Benzene**	1	1	U	1	U	1	U	1	U	1	U	50	U	100	U
74-97-5	**Bromochloromethane**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
75-27-4	**Bromodichloromethane**	50(GV)	0.5	U	0.5	U	1	U	0.5	U	0.5	U	50	U	100	U
75-25-2	**Bromoform**	50(GV)	2	U	1	U	1	U	2	U	2	U	50	U	100	U
74-83-9	**Bromomethane**	5	2	U	2	U	2	U	5	U	5	U	50	U	100	U
75-15-0	**Carbon Disulfide**	NS	4	U	4	U	4	U	4	U	4	U	50	U	**67**	**J**
56-23-5	**Carbon Tetrachloride**	5	5	U	5	U	5	U	5	U	5	U	50	U	100	U
108-90-7	**Chlorobenzene**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
75-00-3	**Chloroethane**	5	2	U	2	U	2	U	2	U	5	U	**4,000**		**420**	
67-66-3	**Chloroform**	7	2	U	2	U	2	U	2	U	2	U	50	U	100	U
74-87-3	**Chloromethane**	5	2	U	2	U	2	U	2	U	5	U	**32**	**J**	100	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	50	U	100	U
10061-02-6	**trans-1,3-Dichloropropene**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	50	U	100	U
110-82-7	**Cyclohexane**	NS	5	U	5	U	5	U	5	U			50	U	100	U
124-48-1	**Dibromochloromethane**	50(GV)	0.5	U	0.5	U	0.5	U	1	U	2	U	50	U	100	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	2	U	2	U (V-05)	2	U	2	U	2	U	50	U	100	U
75-09-2	**Dichloromethane**	5														
64-17-5	**Ethanol (ug/L)**	NS			50	U	50	U(V-05)	50	U	50	U				
100-41-4	**Ethyl Benzene**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
98-82-8	**Isopropylbenzene**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
79-20-9	**Methyl Acetate**	NS	5	U (V-05)	1	U	2	U	1	U (L-04, V-05)	1	U (L-04)	50	U	100	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1	U	1	U	1	U	1	U	1	U	50	U	100	U
108-88-3	**Methylbenzene**	5														
108-87-2	**Methylcyclohexane**	50	1	U	1	U	1	U	1	U	1	U	50	U	100	U
75-09-2	**Methylene chloride**	5	5	U	5	U	5	U	5	U	5	U	**78**		**180**	
179601-23-1	**m/p-Xylenes**	5	2	U	1	U	2	U	2	U	2	U	100	U	200	U
95-47-6	**o-Xylenes**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
100-42-5	**Styrene**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
127-18-4	**Tetrachloroethene**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
108-88-3	**Toluene**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
79-01-6	**Trichloroethene**	5	1	U	1	U	1	U	1	U	1	U	50	U	100	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	2	U	2	U	2	U	2	U(L-04)	2	U	50	U	100	U
75-01-4	**Vinyl chloride**	2	2	U	2	U	2	U	2	U	2	U	**26.5**	**J**	**160.0**	
	Total detected CVOCs	NS	**ND**		**ND**		**ND**		**ND**		**ND**		**42,154**		**77,960**	
	Total detected VOCs	NS	**ND**		**ND**		**ND**		**ND**		**ND**		**42,154**		**78,027**	
	Acetic Acid (ug/L)	NS	NA		290	U	290	U	290	U	20	U	NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

CAS No.	VOC (µg/l)	AWQS/GV	SOG A-2		SOG A-2		SOG A-2 (Note A)		SOG A-2		SOG A-2		SOG C-2		SOG C-2		SOG C-2		SOG C-2 (Note A)	
	Date		5/3/2016		7/19/2016		12/15/2016		4/5/2017		7/13/2017		1/6/2016		3/8/2016		5/2/2016		9/22/2016	
	Screen Interval (ft bgs)		8.5-23		8.5-23		8.5-23		8.5-23		8.5-23		8.5-23		8.5-23		8.5-23		8.5-23	
	Area		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A	
71-55-6	1,1,1-Trichloroethane	5	7.5	J	20	U	1	U	2	U	2	U	300		100	U	1600		10	U
79-34-5	1,1,2,2-Tetrachloroethane	5	2	U	10	U	0.5	U	1	U	1	U	50	U	100	U	10	U	5	U
79-00-5	1,1,2-Trichloroethane	1	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
75-34-3	1,1-Dichloroethane	5	1300		930		38		82		58		63,900	D	28,900	D,EB2	4,300		480	
75-35-4	1,1-Dichloroethene	5	2	U	20	U	2.5		6.1		2	U	29	J	100	U	52.5		19	
87-61-6	1,2,3-Trichlorobenzene	5	2	U	100	U	5	U (V-05)	10	U	10	U	50	U	100	U	10	U	50	U
120-82-1	1,2,4-Trichlorobenzene	5	2	U	20	U	1	U (V-05)	4	U	2	U	50	U	100	U	10	U	10	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	2	U	100	U	5	U	10	U	10	U	50	U	100	U	10	U	50	U
106-93-4	1,2-Dibromoethane	NS	2	U	10	U	0.5	U	1	U	1	U	50	U	100	U	10	U	5	U
95-50-1	1,2-Dichlorobenzene	3	2	U	20	U	6.3		4.4		2	U	50	U	100	U	10	U	10	U
107-06-2	1,2-Dichloroethane	0.6	430		130		8		7.2		7.5		13,800	D	7,500	EB2	1300		180	
78-87-5	1,2-Dichloropropane	1	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
541-73-1	1,3-Dichlorobenzene	3	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
142-28-9	1,3-Dichloropropane	5			10	U	0.5	U	1	U	1	U							5	U
106-46-7	1,4-Dichlorobenzene	3	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
123-91-1	1,4-Dioxane	0.35	1,000	U	1,000	U (V-05)	59		100	U	100	U	5,000	U	10,000	U	5,000	U	500	U (V-05)
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	400		450		110		82		140		230	J	500	U	130	U	200	U
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	25	U	200	U	10	U	20	U	20	U	250	U	500	U	130	U	100	U
108-10-1	4-Methyl-2-pentanone	NS	16.7	J	200	U	10	U	20	U	20	U	64.5	J	500	U	50	U	100	U
67-64-1	Acetone	50 (GV)	710		1,000	U	790		260		210		580		500	U	50	U	500	U
71-43-2	Benzene	1	2	U	20	U	2.8		2	U	2	U	50	U	100	U	10	U	10	U
74-97-5	Bromochloromethane	5	5	U	20	U	1	U	2	U	2	U	50	U	100	U	25	U	10	U
75-27-4	Bromodichloromethane	50(GV)	2	U	10	U	0.5	U	1	U	1	U	50	U	100	U	10	U	5	U
75-25-2	Bromoform	50(GV)	2	U	40	U	1	U	2	U	4	U	50	U	100	U	10	U	10	U
74-83-9	Bromomethane	5	2	U	40	U	2	U	4	U	10	U	50	U	100	U	10	U	20	U
75-15-0	Carbon Disulfide	NS	2	U	80	U	4	U	8	U	8	U	40.5	J	100	U	10	U	40	U
56-23-5	Carbon Tetrachloride	5	2	U	100	U	5	U	10	U	10	U	50	U	100	U	10	U	50	U
108-90-7	Chlorobenzene	5	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
75-00-3	Chloroethane	5	5	U	40	U	120		12		10	U	16,000	D	2,900		25	U	20	U
67-66-3	Chloroform	7	2	U	40	U	2	U	4	U	4	U	50	U	100	U	10	U	20	U
74-87-3	Chloromethane	5	2	U	40	U	2	U	4	U	10	U	25	J	100	U	10	U	10	U
156-59-2	cis-1,2-Dichloroethene (3)	5	2	U	20	U	5		4.9		2	U	50	U	100	U	10	U	10	U
10061-01-5	cis-1,3-Dichloropropene	0.4	2	U	10	U	0.5	U	1	U	1	U	50	U	100	U	10	U	50	U
10061-02-6	trans-1,3-Dichloropropene		2	U	10	U	1	U	1	U	1	U	50	U	100	U	10	U	10	U
110-82-7	Cyclohexane	NS	2	U	100	U	5	U	10	U			50	U	100	U	10	U	20	U
124-48-1	Dibromochloromethane	50(GV)	2	U	10	U	0.5	U	1	U	4	U	50	U	100	U	10	U	20	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5	2	U	40	U (V-05)	2	U (V-05)	4	U	4	U	50	U	100	U	10	U	20	U
75-09-2	Dichloromethane	5																		
64-17-5	Ethanol (ug/L)	NS					3,000	E	1,700		100	U								
100-41-4	Ethyl Benzene	5	2	U	20	U	2		2	U	2	U	50	U	100	U	10	U	10	U
98-82-8	Isopropylbenzene	5	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
79-20-9	Methyl Acetate	NS	5	U	100	U	1	U	2	U	2	U	50	U	100	U	25	U	10	U (V-05)
1634-04-4	Methyl tert-butyl ether	10(GV)	5	U	20	U	2.5		2	U	2	U	24.5	J	100	U	25	U	10	U
108-88-3	Methylbenzene	5																		
108-87-2	Methylcyclohexane	50	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
75-09-2	Methylene chloride	5	18.8		100	U	5	U	10	U	10	U	160		120		10	U	50	U
179601-23-1	m/p-Xylenes	5	4	U	40	U	3.2		4	U	4	U	100	U	200	U	20	U	20	U
95-47-6	o-Xylenes	5	2	U	20	U	2.5		2	U	2	U	50	U	100	U	10	U	10	U
100-42-5	Styrene	5	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
127-18-4	Tetrachloroethene	5	2	U	20	U	1	U	2	U	2	U	50	U	100	U	10	U	10	U
108-88-3	Toluene	5	2	U	20	U	1.9		2	U	2	U	50	U	100	U	10	U	10	U
156-60-5	trans-1,2-Dichloroethene (3)	5	2	U	20	U	1.2		2	U	2	U	50	U	100	U	10	U	10	U
79-01-6	Trichloroethene	5	2	U	20	U	2		2	U	2	U	50	U	100	U	10	U	10	U
75-69-4	Trichlorofluoromethane (CFC-11)	5	2	U	40	U	2	U	4	U	4	U	50	U	100	U	10	U	20	U
75-01-4	Vinyl chloride	2	63.8		270		16		70		300		150		81	J	68.5		61	
	Total detected CVOCs	NS	1,820		1,330		258		187		366		94,364		39,381		7,321		740	
	Total detected VOCs	NS	2,947		1,780		4,171		2,229		716		95,304		39,501		7,321		740	
	Acetic Acid (ug/L)	NS	NA		NA		61,700		222,000		205,000		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	SOG C-2 (Note A)		SOG C-2		SOG C-2		SOG C-6		SOG C-6		SOG C-6 (Note A)		SOG C-6 (Note A)		SOG C-6 (Note A)	
	Date		12/15/2016		4/5/2017		7/13/2017		1/6/2016		3/8/2016		5/2/2016		4/5/2017		7/14/2017	
	Screen Interval (ft bgs)		8.5-23		8.5-23		8.5-23		8.5-23		8.5-23		8.5-23		8.5-23		8.5-23	
	Area		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A	
CAS No.	VOC (µg/l)																	
71-55-6	1,1,1-Trichloroethane	5	5	U	1	U	1	U	**0.39**	**J**	20	U	20	U	10	U	1	U
79-34-5	1,1,2,2-Tetrachloroethane	5	2.5	U	0.5	U	0.5	U	1	U	20	U	20	U	5	U	0.5	U
79-00-5	1,1,2-Trichloroethane	1	5	U	1	U	1	U	1	U	20	U	20	U	10	U	1	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	5	U	1	U	1	U	1	U	20	U	20	U	10	U	1	U
75-34-3	1,1-Dichloroethane	5	**59**		**17**		**60**		**37,400**	**D**	**41,300**	**D,EB1**	**10000**		**53**		**2.9**	
75-35-4	1,1-Dichloroethene	5	**8**		**3**		**3**		**2.3**		20	U	20	U	10	U	1	U
87-61-6	1,2,3-Trichlorobenzene	5	25	U	5	U	5	U	1	U	20	U	20	U	50	U	5	U
120-82-1	1,2,4-Trichlorobenzene	5	5	U	1	U	1	U	1	U	20	U	20	U	20	U	1	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	25	U	5	U	5	U	1	U	20	U	20	U	50	U	5	U
106-93-4	1,2-Dibromoethane	NS	2.5	U	0.5	U	0.5	U	1	U	20	U	20	U	5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	3	**16**		**12**		1	U	1	U	20	U	20	U	10	U	1	U
107-06-2	1,2-Dichloroethane	0.6	**7.8**		**3**		**16**		**370**	**D**	**770**	**EB1**	**670**		**18**		2	U
78-87-5	1,2-Dichloropropane	1	5	U	1	U	1	U	**0.62**	**J**	20	U	20	U	10	U	1	U
541-73-1	1,3-Dichlorobenzene	3	5	U	1	U	1	U	1	U	20	U	20	U	10	U	1	U
142-28-9	1,3-Dichloropropane	5	2.5	U	0.5	U	0.5	U							5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	3	5	U	**2.3**		1	U	1	U	20	U	20	U	10	U	1	U
123-91-1	1,4-Dioxane	0.35	250	U	50	U	**190**		100	U	2,000	U	10,000	U	500	U	50	U (V-05)
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	100	U	20	U	**43**		5	U	100	U	250	U	**1,700**		**81**	
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	50	U	10	U	10	U	5	U	100	U	250	U	100	U	10	U
108-10-1	4-Methyl-2-pentanone	NS	50	U	10	U	10	U	5	U	100	U	100	U	100	U	10	U
67-64-1	Acetone	50 (GV)	250	U	50	U	**64**		**2.7**	**J**	100	U	100	U	**4,800**		**320**	
71-43-2	Benzene	1	**6**		**2.5**		1	U	1	U	20	U	20	U	**14**		1	U
74-97-5	Bromochloromethane	5	5	U	1	U	1	U	1	U	20	U	50	U	10	U	1	U
75-27-4	Bromodichloromethane	50(GV)	2.5	U	0.5	U	0.5	U	1	U	20	U	20	U	5	U	0.5	U
75-25-2	Bromoform	50(GV)	5	U	2	U	2	U	1	U	20	U	20	U	10	U	2	U
74-83-9	Bromomethane	5	10	U	5	U	5	U	1	U	20	U	20	U	20	U (R-05)	5	U
75-15-0	Carbon Disulfide	NS	20	U	4	U	4	U	**4.1**		**6.6**	**J,EB1**	20	U	40	U	4	U
56-23-5	Carbon Tetrachloride	5	25	U	5	U	5	U	1	U	20	U	20	U	50	U	5	U
108-90-7	Chlorobenzene	5	5	U	**2**		1	U	1	U	20	U	20	U	10	U	1	U
75-00-3	Chloroethane	5	**560**		**41**		5	U	**55.6**		**1,900**	**EB1**	**4900**		20	U	5	U
67-66-3	Chloroform	7	10	U	2	U	2	U	1	U	20	U	20	U	20	U	2	U
74-87-3	Chloromethane	5	10	U	2	U	5	U	**2.6**		20	U	20	U	20	U	5	U
156-59-2	cis-1,2-Dichloroethene (3)	5	**8.4**		**6.2**		**2.6**		1	U	20	U	20	U	10	U	1	U
10061-01-5	cis-1,3-Dichloropropene	0.4	2.5	U	0.5	U	0.5	U	1	U	20	U	20	U	5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene		2.5	U	0.5	U	0.5	U	1	U	20	U	20	U	5	U	0.5	U
110-82-7	Cyclohexane	NS	25	U	5	U			1	U	20	U	20	U	50	U		
124-48-1	Dibromochloromethane	50(GV)	2.5	U	1	U	2	U	1	U	20	U	20	U	5	U	2	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5	10	U (V-05)	2	U	2	U	1	U	20	U	20	U	20	U (V-05)	2	U (V-05)
75-09-2	Dichloromethane	5																
64-17-5	Ethanol (ug/L)	NS	**1,600**		**160**		50	U							**11,000**			
100-41-4	Ethyl Benzene	5	**9.6**		**1.1**		1	U	1	U	20	U	20	U	10	U	1	U
98-82-8	Isopropylbenzene	5	5	U	1	U	1	U	1	U	20	U	20	U	10	U	1	U
79-20-9	Methyl Acetate	NS	5	U	1	U (L-04, V-05)	1	U (L-04)	1	U	20	U	50	U	10	U (L-04)	1	U (L-04,V-05)
1634-04-4	Methyl tert-butyl ether	10(GV)	5	U	1	U	2.5	U	1	U	20	U	50	U	10	U	1	U (L-04,V-05)
108-88-3	Methylbenzene	5																
108-87-2	Methylcyclohexane	50	5	U	**1.2**		1	U	1	U	20	U	20	U	10	U	1	U
75-09-2	Methylene chloride	5	25	U	5	U	5	U	**17.3**		20	U	20	U	50	U	5	U
179601-23-1	m/p-Xylenes	5	**16**		2	U	2	U	2	U	40	U	40	U	20	U	2	U
95-47-6	o-Xylenes	5	**12**		1	U	1	U	1	U	20	U	20	U	10	U	1	U
100-42-5	Styrene	5	5	U	1	U	1	U	1	U	20	U	20	U	10	U	1	U
127-18-4	Tetrachloroethene	5	5	U	1	U	1	U	1	U	20	U	20	U	10	U	1	U
108-88-3	Toluene	5	5	U	**1.7**		1	U	1	U	20	U	20	U	10	U	1	U
156-60-5	trans-1,2-Dichloroethene (3)	5	5	U	**2.4**		1	U	1	U	20	U	20	U	10	U	1	U(L-04, V-05)
79-01-6	Trichloroethene	5	**7.9**		**3.6**		1	U	1	U	20	U	20	U	10	U	1	U
75-69-4	Trichlorofluoromethane (CFC-11)	5	10	U	2	U(L-04)	2	U	1	U	20	U	20	U	20	U	2	U
75-01-4	Vinyl chloride	2	**13**		**17**		**220**		200	UD	**220**	**EB1**	**65**	**J**	20	U	**4.9**	
	Total detected CVOCs	NS	680		110		301		38,049		44,190		15,635		71		8	
	Total detected VOCs	NS	2,324		276		598		38,056		44,197		15,635		17,585		409	
	Acetic Acid (ug/L)	NS	**5,000**		290	U	14,500	U	NA		NA		NA		290	U	**7,000**	**J**

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	SOG E-6		SOG E-6		SOG E-6		SOG E-6		SOG E-6 (Note A)		SOG E-6		SOG E-6		SOG E-6		SOG F-9	
	Date		1/6/2016		3/8/2016		5/3/2016		7/19/2016		9/23/2016		2/8/2017		4/6/2017		7//13/17		1/6/2016	
	Screen Interval (ft bgs)		8.5-33		8.5-33		8.5-33		8.5-33		8.5-33		8.5-33		8.5-33		8.5-33		8.5-53	
	Area		Area B		Area B		Area B		Area B		Area B		Area B		Area B		Area B		Area C	
CAS No.	VOC (µg/l)																			
71-55-6	1,1,1-Trichloroethane	5	28,100	D	83,000	D,EB1	10,800		500	U	20	U	2	U	1	U	5	U	40,700	D
79-34-5	1,1,2,2-Tetrachloroethane	5	100	U	100	U	20	U	250	U	10	U	1	U	0.5	U	2.5	U	100	U
79-00-5	1,1,2-Trichloroethane	1	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
75-34-3	1,1-Dichloroethane	5	306,000	D	251,200	D,EB1	188,000	D	49,000		1,400		9		3		5	U	41,800	D
75-35-4	1,1-Dichloroethene	5	340		820	EB1	1,500		970		38		2	U	1	U	5	U	42	J
87-61-6	1,2,3-Trichlorobenzene	5	100	U	100	U	20	U	2,500	U	100	U	10	U	5	U	25	U	100	U
120-82-1	1,2,4-Trichlorobenzene	5	100	U	100	U	20	U	500	U	20	U	2	U	2	U	5	U	100	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	100	U	100	U	20	U	2,500	U	100	U	10	U	5	U	25	U	100	U
106-93-4	1,2-Dibromoethane	NS	100	U	100	U	20	U	250	U	10	U	1	U	0.5	U	2.5	U	100	U
95-50-1	1,2-Dichlorobenzene	3	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
107-06-2	1,2-Dichloroethane	0.6	25,100	D	20,800	D,EB1	20,600	D	5,600		290		2	U	1	U	10	U	51	J
78-87-5	1,2-Dichloropropane	1	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
541-73-1	1,3-Dichlorobenzene	3	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
142-28-9	1,3-Dichloropropane	5							250	U	10	U	1	U	0.5	U	2.5	U		
106-46-7	1,4-Dichlorobenzene	3	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
123-91-1	1,4-Dioxane	0.35	10,000	U	10,000	U	10000	U	25,000	U (V-05)	1,000	U (V-05)	100	U	68		250	U	10,000	U
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	920		500	U	1,000		10,000	U	400	U	120		52		380		500	U
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	500	U	500	U	250	U	5,000	U	200	U	20	U	10	U	50	U	500	U
108-10-1	4-Methyl-2-pentanone	NS	130	J	500	U	100	U	5,000	U	200	U	20	U	10	U	50	U	500	U
67-64-1	Acetone	50 (GV)	1,800		550		1,900		25,000	U	1,500		1,300		580		3,300		210	J
71-43-2	Benzene	1	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
74-97-5	Bromochloromethane	5	100	U	100	U	50	U	500	U	20	U	2	U	1	U	5	U	100	U
75-27-4	Bromodichloromethane	50(GV)	100	U	100	U	20	U	250	U	10	U	2	U	0.5	U	2.5	U	100	U
75-25-2	Bromoform	50(GV)	100	U	100	U	20	U	1,000	U	20	U	2	U	1	U	10	U	100	U
74-83-9	Bromomethane	5	100	U	100	U	20	U	1,000	U	40	U	4	U (R-05)	2	U (R-05)	25	U	100	U
75-15-0	Carbon Disulfide	NS	100	U	100	U	20	U	2,000	U	80	U	8	U	4	U	20	U	51	J
56-23-5	Carbon Tetrachloride	5	100	U	100	U	20	U	2,500	U	100	U	10	U	5	U	25	U	100	U
108-90-7	Chlorobenzene	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
75-00-3	Chloroethane	5	400		300	EB1	98	J	1,000	U	40	U	4	U	2	U	25	U	100	U
67-66-3	Chloroform	7	250		260	EB1	130		1,000	U	40	U	4	U	2	U	10	U	100	U
74-87-3	Chloromethane	5	62	J	100	U	20	U	1,000	U	40	U	4	U	2	U	25	U	29	J
156-59-2	cis-1,2-Dichloroethene (3)	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
10061-01-5	cis-1,3-Dichloropropene	0.4	100	U	100	U	20	U	250	U	10	U	1	U	0.5	U	2.5	U	100	U
10061-02-6	trans-1,3-Dichloropropene		100	U	100	U	20	U	250	U	10	U	1	U	0.5	U	2.5	U	100	U
110-82-7	Cyclohexane	NS	100	U	100	U	20	U	2,500	U	100	U	1	U	5	U			100	U
124-48-1	Dibromochloromethane	50(GV)	100	U	100	U	20	U	250	U	40	U	1	U	0.5	U	10	U	100	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5	100	U	100	U	20	U	1,000	U (V-05)	40	U	4	U	2	U (V-05)	10	U	100	U
75-09-2	Dichloromethane	5																		
64-17-5	Ethanol (ug/L)	NS											2,900	V-05	6,700		2,100			
100-41-4	Ethyl Benzene	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
98-82-8	Isopropylbenzene	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
79-20-9	Methyl Acetate	NS	100	U	100	U	50	U	2,500	U	20	U (V-05)	4	U	1	U (L-04)	5	U (L-04)	100	U
1634-04-4	Methyl tert-butyl ether	10(GV)	100	U	100	U	50	U	500	U	20	U	2	U	1	U	5	U	100	U
108-88-3	Methylbenzene	5																		
108-87-2	Methylcyclohexane	50	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
75-09-2	Methylene chloride	5	100	U	200	EB1	180		2,500	U	100	U	10	U	5	U	25	U	100	U
179601-23-1	m/p-Xylenes	5	200	U	200	U	40	U	1,000	U	40	U	4	U	2	U	10	U	200	U
95-47-6	o-Xylenes	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
100-42-5	Styrene	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
127-18-4	Tetrachloroethene	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
108-88-3	Toluene	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
156-60-5	trans-1,2-Dichloroethene (3)	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
79-01-6	Trichloroethene	5	100	U	100	U	20	U	500	U	20	U	2	U	1	U	5	U	100	U
75-69-4	Trichlorofluoromethane (CFC-11)	5	100	U	100	U	20	U	1,000	U	40	U	4	U	2	U	10	U	100	U
75-01-4	Vinyl chloride	2	3,900		90	J,EB1	1,600		1,000	U	40	U	4	U	2	U	10	U	100	U
	Total detected CVOCs	NS	364,152		356,670		222,778		80,550		1,728		9		3		ND		82,622	
	Total detected VOCs	NS	367,002		357,220		225,808		80,550		3,228		4,329		7,335		5,780		82,883	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		623,000		176,000		297,000		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
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Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	SOG F-9		SOG F-9		SOG F-9		SOG F-9 (Note A)		SOG F-9 (Note A)		SOG G-4		SOG G-4		SOG G-4		SOG G-4 (Note A)		SOG G-4	
	Date		3/8/2016		5/3/2016		7/19/2016		9/22/2016		7/14/2017		1/6/2016		3/8/2016		5/2/2016		7/19/2016		4/6/2017	
	Screen Interval (ft bgs)		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53		8.5 - 23		8.5 - 23		8.5 - 23		8.5 - 23		8.5 - 23	
	Area		Area C		Area C		Area C		Area C		Area C		Area A		Area A		Area A		Area A		Area A	
CAS No.	*VOC (µg/l)*																					
71-55-6	**1,1,1-Trichloroethane**	5	**67,700**	**D,EB1**	**25,000**	**D**	**1,300**		**44**		1	U	100	U	100	U	20	U	100	U	25	U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	100	U	20	U	50	U	2.5	U	0.5	U	100	U	100	U	20	U	50	U	12	U
79-00-5	**1,1,2-Trichloroethane**	1	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
75-34-3	**1,1-Dichloroethane**	5	**244,400**	**D,EB1**	**91,500**	**D**	**5,900**		**480**		1	U	**22,200**	**D**	**63,200**	**D,EB1**	**22,200**	**D**	**11,000**		**2,700**	
75-35-4	**1,1-Dichloroethene**	5	**15,900**	**EB1**	**1,900**		**920**		**14**		1	U	**31**	**J**	**240**	**EB1**	20	U	**110**		**94**	
87-61-6	**1,2,3-Trichlorobenzene**	5	100	U	20	U	500	U	25	U	5	U	100	U	100	U	20	U	500	U	120	U
120-82-1	**1,2,4-Trichlorobenzene**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	50	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	100	U	20	U	500	U	25	U	5	U	100	U	100	U	20	U	500	U	120	U
106-93-4	**1,2-Dibromoethane**	NS	100	U	20	U	50	U	3	U	0.5	U	100	U	100	U	20	U	50	U	12	U
95-50-1	**1,2-Dichlorobenzene**	3	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
107-06-2	**1,2-Dichloroethane**	0.6	**440**	**EB1**	**200**		100	U	**8.8**		2	U	**2,800**		**11,500**	**EB1**	**5,700**		**2,300**		**820**	
78-87-5	**1,2-Dichloropropane**	1	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
541-73-1	**1,3-Dichlorobenzene**	3	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
142-28-9	**1,3-Dichloropropane**	5					50	U	2.5	U	0.5	U							50	U	12	U
106-46-7	**1,4-Dichlorobenzene**	3	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
123-91-1	**1,4-Dioxane**	0.35	10,000	U	10,000	U	5,000	U (V-05)	250	U (V-05)	50	U (V-05)	10,000	U	10,000	U	10,000	U	5,000	U (V-05)	1,200	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	500	U	**890**		2,000	U	**1,700**		**92**		500	U	500	U	250	U	2,000	U	500	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	500	U	250	U	1,000	U	50	U	10	U	500	U	500	U	250	U	1,000	U	250	U
108-10-1	**4-Methyl-2-pentanone**	NS	500	U	100	U	1,000	U	50	U	10	U	500	U	500	U	100	U	1,000	U	250	U
67-64-1	**Acetone**	50 (GV)	**3,900**		**3,600**		5,000	U	**2,000**		**380**		500	U	**550**		**700**		5,000	U	**1,400**	
71-43-2	**Benzene**	1	100	U	20	U	100	U	5	U	**2**		100	U	100	U	20	U	100	U	25	U
74-97-5	**Bromochloromethane**	5	100	U	50	U	100	U	5	U	1	U	100	U	100	U	50	U	100	U	25	U
75-27-4	**Bromodichloromethane**	50(GV)	100	U	20	U	50	U	2.5	U	0.5	U	100	U	100	U	20	U	50	U	12	U
75-25-2	**Bromoform**	50(GV)	100	U	20	U	200	U	5	U	2	U	100	U	100	U	20	U	200	U	25	U
74-83-9	**Bromomethane**	5	100	U	20	U	200	U	10	U	5	U	100	U	100	U	20	U	200	U	50	U (R-05)
75-15-0	**Carbon Disulfide**	NS	**230**	**EB1**	**93**	**J**	400	U	20	U	4	U	100	U	**97**	**J,EB1**	20	U	400	U	100	U
56-23-5	**Carbon Tetrachloride**	5	100	U	20	U	500	U	25	U	5	U	100	U	100	U	20	U	500	U	120	U
108-90-7	**Chlorobenzene**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
75-00-3	**Chloroethane**	5	100	U	**82**	**J**	200	U	10	U	5	U	**1,700**		**2,600**	**EB1**	**93**	**J**	200	U	50	U
67-66-3	**Chloroform**	7	100	U	20	U	200	U	10	U	2	U	100	U	100	U	20	U	200	U	50	U
74-87-3	**Chloromethane**	5	100	U	20	U	200	U	5	U	5	U	100	U	100	U	20	U	200	U	50	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	**29**	
10061-01-5	**cis-1,3-Dichloropropene**	0.4	100	U	20	U	50	U	25	U	0.5	U	100	U	100	U	20	U	50	U	12	U
10061-02-6	**trans-1,3-Dichloropropene**		100	U	20	U	50	U	5	U	0.5	U	100	U	100	U	20	U	50	U	12	U
110-82-7	**Cyclohexane**	NS	100	U	20	U	500	U	10	U			100	U	100	U	20	U	500	U	120	U
124-48-1	**Dibromochloromethane**	50(GV)	100	U	20	U	50	U	10	U	2	U	100	U	100	U	20	U	50	U	12	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	100	U	20	U	200	U (V-05)	10	U	2	U	100	U	100	U	20	U	200	U (V-05)	50	U (V-05)
75-09-2	**Dichloromethane**	5																				
64-17-5	**Ethanol (ug/L)**	NS																			**18,000**	
100-41-4	**Ethyl Benzene**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
98-82-8	**Isopropylbenzene**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	**49**	**J**	100	U	25	U
79-20-9	**Methyl Acetate**	NS	100	U	50	U	500	U	5	U (V-05)	1	U (L-04,V-05)	100	U	100	U	50	U	500	U	25	U (L-04)
1634-04-4	**Methyl tert-butyl ether**	10(GV)	100	U	50	U	100	U	5	U	1	U (L-04,V-05)	100	U	**53**	**J**	**37**	**J**	100	U	**46**	
108-88-3	**Methylbenzene**	5																				
108-87-2	**Methylcyclohexane**	50	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
75-09-2	**Methylene chloride**	5	100	U	20	U	500	U	25	U	5	U	100	U	**140**	**EB1**	**74**	**J**	500	U	120	U
179601-23-1	**m/p-Xylenes**	5	200	U	40	U	200	U	10	U	2	U	200	U	200	U	40	U	200	U	50	U
95-47-6	**o-Xylenes**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
100-42-5	**Styrene**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
127-18-4	**Tetrachloroethene**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
108-88-3	**Toluene**	5	100	U	20	U	100	U	5	U	1	U	100	U	100	U	20	U	100	U	25	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	100	U	20	U	100	U	5	U	1	U (L-04,V-05)	100	U	100	U	20	U	100	U	25	U
79-01-6	**Trichloroethene**	5	100	U	**24**	**J**	100	U	5	U	1	U	100	U	100	U	20	U	100	U	**40**	
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	100	U	20	U	200	U	10	U	2	U	100	U	100	U	20	U	200	U	50	U
75-01-4	**Vinyl chloride**	2	**530**	**EB1**	**1,700**		**250**		10	U	2	U	100	U	**79**	**J,EB1**	**550**		**290**		**160**	
	Total detected CVOCs	NS	**328,970**		**120,406**		**8,370**		**547**		**ND**		**26,731**		**77,759**		**28,617**		**13,700**		**3,843**	
	Total detected VOCs	NS	**333,100**		**124,989**		**8,370**		**4,247**		**474**		**26,731**		**78,459**		**29,403**		**13,700**		**23,289**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		**30,000**		NA		NA		NA		NA		**109,000**	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	SOG G-4		SOG G-8		SOG G-8		SOG G-8 (Note A)		SOG G-8 (Note A)		SOG I-10		SOG I-10		SOG I-10		SOG I-10		SOG I-10 (Note A)		SOG I-10 (Note A)	
	Date		7/14/2017		1/6/2016		3/8/2016		5/2/2016		7/14/2017		1/5/2016		3/8/2016		5/2/2016		7/18/2016		9/22/2016		4/6/2017	
	Screen Interval (ft bgs)		8.5 - 23		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53	
	Area		Area A		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C	
CAS No.	VOC (µg/l)																							
71-55-6	1,1,1-Trichloroethane	5	25	U	66,100	D	1,900	EB2	93,800	D	2		5900	D	1900	EB2	13.6		7,400		6,600		1	U
79-34-5	1,1,2,2-Tetrachloroethane	5	12	U	50	U	50	U	20	U	1	U	1	U	20	U	0.2	U	50	U	50	U	0.5	U
79-00-5	1,1,2-Trichloroethane	1	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
75-34-3	1,1-Dichloroethane	5	1,600		106,800	D	6,100	EB2	79,200	D	2	U	14800	D	11600	D,EB2	440	D	1200		500		4.9	
75-35-4	1,1-Dichloroethene	5	150		190		210	EB2	12,300		2		32.2		97.6	EB2	5.1		1300		890		2.6	
87-61-6	1,2,3-Trichlorobenzene	5	120	U	50	U	50	U	20	U	10	U	1	U	20	U	0.2	U	500	U	500	U	5	U
120-82-1	1,2,4-Trichlorobenzene	5	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	2	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	120	U	50	U	50	U	20	U	10	U	1	U	20	U	0.2	U	500	U	500	U	5	U
106-93-4	1,2-Dibromoethane	NS	12	U	50	U	50	U	20	U	1	U	1	U	20	U	0.2	U	50	U	50	U	0.5	U
95-50-1	1,2-Dichlorobenzene	3	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
107-06-2	1,2-Dichloroethane	0.6	82		2,300		200	EB2	5,200		4	U	45.3		61	EB2	4.3		100		100	U	1.1	
78-87-5	1,2-Dichloropropane	1	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
541-73-1	1,3-Dichlorobenzene	3	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
142-28-9	1,3-Dichloropropane	5	12	U							1	U							50	U	50	U	0.5	U
106-46-7	1,4-Dichlorobenzene	3	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
123-91-1	1,4-Dioxane	0.35	1,200	U	5,000	U	5,000	U	10000	U	100	U (V-05)	100	U	2000	U	100	U	5,000	U (V-05)	5,000	U (V-05)	50	U
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	500	U	920		250	U	4,100		120		71.1		100	U	2.5	U	2,000	U	2,000	U	69	
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	250	U	250	U	250	U	250	U	20	U	5	U	100	U	2.5	U	1,000	U	1,000	U	10	U
108-10-1	4-Methyl-2-pentanone	NS	250	U	250	U	250	U	100	U	20	U	5	U	100	U	1	U	1,000	U	1,000	U	10	U
67-64-1	Acetone	50 (GV)	1200	U	580		250	U	3,500		740		49.6		100	U	18.7		5,000	U	5,000	U	470	
71-43-2	Benzene	1	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	3.8	
74-97-5	Bromochloromethane	5	25	U	50	U	50	U	50	U	2	U	1	U	20	U	0.5	U	100	U	100	U	1	U
75-27-4	Bromodichloromethane	50(GV)	12	U	50	U	50	U	20	U	1	U	1	U	20	U	0.2	U	50	U	50	U	0.5	U
75-25-2	Bromoform	50(GV)	50	U	50	U	50	U	20	U	4	U	1	U	20	U	0.2	U	200	U	100	U	1	U
74-83-9	Bromomethane	5	120	U	50	U	50	U	20	U	10	U	1	U	20	U	0.2	U	200	U	200	U	2	U(R-05)
75-15-0	Carbon Disulfide	NS	100	U	50	U	50	U	20	U	8	U	19.3		20	U	0.2	U	400	U	400	U	4	U
56-23-5	Carbon Tetrachloride	5	120	U	50	U	50	U	20	U	10	U	1	U	20	U	0.2	U	500	U	500	U	5	U
108-90-7	Chlorobenzene	5	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
75-00-3	Chloroethane	5	270		290		50	U	54	J	10	U	36.8		20	U	0.5	U	200	U	200	U	2	U
67-66-3	Chloroform	7	50	U	69		50	U	110		4	U	1.5		20	U	0.2	U	200	U	200	U	2	U
74-87-3	Chloromethane	5	120	U	26	J	50	U	20	U	10	U	1.8		20	U	0.2	U	200	U	100	U	2	U
156-59-2	cis-1,2-Dichloroethene (3)	5	42		50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
10061-01-5	cis-1,3-Dichloropropene	0.4	12	U	50	U	50	U	20	U	1	U	1	U	20	U	0.2	U	50	U	50	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene		12	U	50	U	50	U	20	U	1	U	1	U	20	U	0.2	U	50	U	50	U	0.5	U
110-82-7	Cyclohexane	NS			50	U	50	U	20	U			1	U	20	U	0.2	U	500	U	500	U	5	U
124-48-1	Dibromochloromethane	50(GV)	50	U	50	U	50	U	20	U	4	U	1	U	20	U	0.2	U	50	U	200	U	0.5	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5	50	U	50	U	50	U	20	U	4	U	1	U	20	U	0.2	U	200	U (V-05)	200	U	2	U(V-05)
75-09-2	Dichloromethane	5																						
64-17-5	Ethanol (ug/L)	NS	1200	U																			1,300	
100-41-4	Ethyl Benzene	5	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
98-82-8	Isopropylbenzene	5	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.41	J	100	U	100	U	1	U
79-20-9	Methyl Acetate	NS	25	U (L-04)	50	U	50	U	50	U	2	U (L-04, V-05)	1	U	20	U	0.5	U	500	U	100	U (V-05)	1	U(L-04)
1634-04-4	Methyl tert-butyl ether	10(GV)	25		50	U	50	U	50	U	2	U (L-04, V-05)	2.5		20	U	2.3		100	U	100	U	1	U
108-88-3	Methylbenzene	5																						
108-87-2	Methylcyclohexane	50	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
75-09-2	Methylene chloride	5	120	U	35	J	50	U	20	U	10	U	1.2		20	U	0.2	U	500	U	500	U	5	U
179601-23-1	m/p-Xylenes	5	50	U	100	U	100	U	40	U	4	U	2	U	40	U	0.4	U	200	U	200	U	2	U
95-47-6	o-Xylenes	5	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
100-42-5	Styrene	5	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
127-18-4	Tetrachloroethene	5	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1	U
108-88-3	Toluene	5	25	U	50	U	50	U	20	U	2	U	1	U	20	U	0.2	U	100	U	100	U	1.1	
156-60-5	trans-1,2-Dichloroethene (3)	5	25	U	50	U	50	U	20	U	2	U (L-04,V-05)	1	U	20	U	0.2	U	100	U	100	U	1	U
79-01-6	Trichloroethene	5	46		50	U	50	U	130		2	U	1	U	20	U	0.2	U	100	U	100	U	3	
75-69-4	Trichlorofluoromethane (CFC-11)	5	50	U	50	U	50	U	20	U	4	U	1	U	20	U	0.2	U	200	U	200	U	2	U
75-01-4	Vinyl chloride	2	130		990		29	J	680		4	U	190		6.8	J	0.2	U	200	U	200	U	2	U
	Total detected CVOCs	NS	2,320		176,765		8,439		191,474		4		21,009		13,665		463		10,000		7,990		12	
	Total detected VOCs	NS	2,345		178,300		8,439		199,074		864		21,151		13,665		484		10,000		7,990		1,856	
	Acetic Acid (ug/L)	NS	14,500	U	NA		NA		NA		274,000		NA		NA		NA		NA		NA		118,000	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	SOG I-10 (Note A)		SOG K-8		SOG K-8		SOG K-8		SOG K-8 (Note A)		SOG K-8		SOG K-8		SOG M-12		SOG M-12		SOG M-12		SOG M-12	
	Date		7/13/2017		1/6/2016		3/8/2016		5/3/2016		7/19/2016		4/6/2017		7/14/2017		1/6/2016		3/8/2016		5/2/2016		7/18/2016	
	Screen Interval (ft bgs)		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53		8.5-53		8.5-33		8.5-33		8.5-33		8.5-33	
	Area		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area B		Area B		Area B		Area B	
CAS No.	*VOC (µg/l)*																							
71-55-6	**1,1,1-Trichloroethane**	5	1	U	**20,700**	D	**119,700**	D,EB2	**35,700**	**D**	**46,000**		**24**		5	U	**1.8**		1	U	**5.8**		**2.5**	
79-34-5	**1,1,2,2-Tetrachloroethane**	5	0.5	U	50	U	100	U	20	U	250	U	0.5	U	2.5	U	1	U	1	U	0.2	U	0.5	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
75-34-3	**1,1-Dichloroethane**	5	1	U	**80,600**	D	**78,700**	**D,EB2**	**56,100**	**D**	**37,000**		**76**		**210**		**250**	**D**	**300**	**D,EB1**	**39.9**		**99.0**	
75-35-4	**1,1-Dichloroethene**	5	**16**		**55.5**		**480**	**EB2**	**4,500**		**10,000**		**42**		**210**		**8**		**7**	**EB1**	0.2	U	**2.3**	
87-61-6	**1,2,3-Trichlorobenzene**	5	5	U	50	U	100	U	20.0	U	2,500	U	5	U	25	U	1	U	1	U	**0.22**	**J**	5	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	50	U	100	U	20	U	500	U	2	U	5	U	1	U	1	U	0.2	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	5	U	50	U	100	U	20	U	2,500	U	5	U	25	U	1	U	1	U	0.2	U	5	U
106-93-4	**1,2-Dibromoethane**	NS	0.5	U	50	U	100	U	20	U	250	U	0.5	U	2.5	U	1	U	1	U	0.2	U	0.5	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	2	U	**5,500**		**6,600**	**EB2**	**5,100**		**3,200**		**15**		**12**		**1**		**16.9**	**EB1**	**0.61**	**J**	1	U
78-87-5	**1,2-Dichloropropane**	1	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
142-28-9	**1,3-Dichloropropane**	5	0.5	U							250	U	0.5	U	2.5	U							0.5	U
106-46-7	**1,4-Dichlorobenzene**	3	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
123-91-1	**1,4-Dioxane**	0.35	**67**		5,000	U	10000	U	10,000	U	25,000	U (V-05)	50	U	250	U	100	U	100	U	100	U	50	U (V-05)
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	**170**		**970**		**1,300**		**3,400**		10,000	U	**140**		**120**		5	U	5	U	2.5	U	20	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	10	U	250	U	500	U	250	U	5,000	U	10	U	50	U	5	U	5	U	2.5	U	10	U
108-10-1	**4-Methyl-2-pentanone**	NS	10	U	250	U	500	U	100	U	5,000	U	10	U	50	U	5	U	5	U	1	U	10	U
67-64-1	**Acetone**	50 (GV)	**1600**		**1,600**		**780**		**1,100**		25,000	U	**3,300**		**2,600**		5	U	5	U	1	U	50	U
71-43-2	**Benzene**	1	1	U	50	U	100	U	20	U	500	U	**1.8**		5	U	1	U	1	U	0.2	U	1	U
74-97-5	**Bromochloromethane**	5	1	U	50	U	100	U	50	U	500	U	1	U	5	U	1	U	1	U	0.5	U	1	U
75-27-4	**Bromodichloromethane**	50(GV)	0.5	U	50	U	100	U	20	U	250	U	0.5	U	2.5	U	1	U	1	U	0.2	U	0.5	U
75-25-2	**Bromoform**	50(GV)	2	U	50	U	100	U	20	U	1,000	U	1	U	10	U	1	U	1	U	0.2	U	2	U
74-83-9	**Bromomethane**	5	5	U	50	U	100	U	20	U	1,000	U	2	U(R-05)	25	U	1	U	1	U	0.2	U	2	U
75-15-0	**Carbon Disulfide**	NS	4	U	50	U	100	U	20	U	2,000	U	4	U	20	U	**1**		**1**	**EB1**	0.2	U	4	U
56-23-5	**Carbon Tetrachloride**	5	5	U	50	U	100	U	20	U	2,500	U	5	U	25	U	1	U	1	U	0.2	U	5	U
108-90-7	**Chlorobenzene**	5	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
75-00-3	**Chloroethane**	5	5	U	**120**		100	U	**140**		1,000	U	2	U	25	U	1	U	1	U	0.5	U	2	U
67-66-3	**Chloroform**	7	2	U	**89.5**		**180**		**46**	**J**	1,000	U	2	U	10	U	1	U	1	U	0.2	U	2	U
74-87-3	**Chloromethane**	5	5	U	**29.5**	**J**	100	U	20	U	1,000	U	2	U	25	U	1	U	1	U	0.2	U	2	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	50	U	100	U	20	U	500	U	**4.8**		**21**		**1**		**1.5**		**2**		**1.3**	
10061-01-5	**cis-1,3-Dichloropropene**	0.4	0.5	U	50	U	100	U	20	U	250	U	0.5	U	2.5	U	1	U	1	U	0.2	U	0.5	U
10061-02-6	**trans-1,3-Dichloropropene**		0.5	U	50	U	100	U	20	U	250	U	0.5	U	2.5	U	1	U	1	U	0.2	U	0.5	U
110-82-7	**Cyclohexane**	NS			50	U	100	U	20	U	2,500	U	5	U			1	U	1	U	0.2	U	5	U
124-48-1	**Dibromochloromethane**	50(GV)	2	U	50	U	100	U	20	U	250	U	0.5	U	10	U	1	U	1	U	0.2	U	0.5	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	2	U	50	U	100	U	20	U	1,000	U (V-05)	2	U(V-05)	10	U	1	U	1	U	0.2	U	2	U (V-05)
75-09-2	**Dichloromethane**	5																						
64-17-5	**Ethanol (ug/L)**	NS	**500**										**3,300**		250	U								
100-41-4	**Ethyl Benzene**	5	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
98-82-8	**Isopropylbenzene**	5	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
79-20-9	**Methyl Acetate**	NS	1	U(L-04)	50	U	100	U	50	U	2,500	U	1	U (L-04)	**12**	**L-04**	1	U	1	U	0.5	U	5	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1	U	50	U	100	U	50	U	500	U	1	U	5	U	**2**		**1.1**		**0.67**	**J**	**1.1**	
108-88-3	**Methylbenzene**	5																						
108-87-2	**Methylcyclohexane**	50	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
75-09-2	**Methylene chloride**	5	5	U	**58.5**		100	U	20	U	2,500	U	5	U	25	U	1	U	1	U	0.2	U	5	U
179601-23-1	**m/p-Xylenes**	5	2	U	100	U	200	U	40	U	1,000	U	2	U	10	U	2	U	2	U	0.4	U	2	U
95-47-6	**o-Xylenes**	5	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
100-42-5	**Styrene**	5	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
127-18-4	**Tetrachloroethene**	5	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
108-88-3	**Toluene**	5	1	U	50	U	100	U	20	U	500	U	**2.4**		5	U	1	U	1	U	0.2	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	50	U	100	U	20	U	500	U	1	U	5	U	1	U	1	U	0.2	U	1	U
79-01-6	**Trichloroethene**	5	1	U	50	U	57	J	**810**		**1,600**		**69**		**13**		**3.3**		**3.2**	**EB1**	**3.7**		**2.1**	
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	2	U	50	U	100	U	20	U	1,000	U	2	U	10	U	1	U	1	U	0.2	U	2	U
75-01-4	**Vinyl chloride**	2	2	U	**390**		**26**	**J**	**490**		1,000	U	**34**		**38**		**0.65**	**J**	1	U	**0.31**	**J**	2	U
	Total detected CVOCs	NS	**83**		**107,543**		**205,743**		**102,886**		**97,800**		**267**		**504**		**267**		**329**		**53**		**107**	
	Total detected VOCs	NS	**2,353**		**110,113**		**207,823**		**107,386**		**97,800**		**7,009**		**3,236**		**269.9**		**330.7**		**53.2**		**108.3**	
	Acetic Acid (ug/L)	NS	**47,300**		NA		NA		NA		NA		**556,000**		**402,000**		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	SOG M-12		SOG M-12		SOG M-12 (Note A)		SOG M-12 (Note A)	
	Date		9/22/2016		12/15/2016		2/7/2017		7/13/2017	
	Screen Interval (ft bgs)		8.5-33		8.5-33		8.5-33		8.5-33	
	Area		Area B		Area B		Area B		Area B	
CAS No.	***VOC (µg/l)***									
71-55-6	**1,1,1-Trichloroethane**	5	1	U	**2.1**		**3.7**		**1**	
79-34-5	**1,1,2,2-Tetrachloroethane**	5	0.5	U	1	U	1	U	0.5	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	2	U	2	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	2	U	2	U	1	U
75-34-3	**1,1-Dichloroethane**	5	**150**		**140.0**		**120**		**22**	
75-35-4	**1,1-Dichloroethene**	5	**5.9**		**3.3**		**5.7**		**1.8**	
87-61-6	**1,2,3-Trichlorobenzene**	5	5	U	10	U (V-05)	10	U	5	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	2	U (V-05)	2	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	5	U	10	U	10	U	5	U
106-93-4	**1,2-Dibromoethane**	NS	0.5	U	1	U	1	U	0.5	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	2	U	2	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	1	U	2	U	2	U	2	U
78-87-5	**1,2-Dichloropropane**	1	1	U	2	U	2	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	2	U	2	U	1	U
142-28-9	**1,3-Dichloropropane**	5	0.5	U	1	U	1	U	0.5	U
106-46-7	**1,4-Dichlorobenzene**	3	1	U	2	U	2	U	1	U
123-91-1	**1,4-Dioxane**	0.35	50	U (V-05)	100	U	100	U	50	U (V-05)
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	20	U	40	U	40	U	20	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	10	U	20	U	20	U	10	U
108-10-1	**4-Methyl-2-pentanone**	NS	10	U	20	U	20	U	10	U
67-64-1	**Acetone**	50 (GV)	50	U	100	U	100	U	50	U
71-43-2	**Benzene**	1	1	U	2	U	2	U	1	U
74-97-5	**Bromochloromethane**	5	1	U	2	U	2	U	1	U
75-27-4	**Bromodichloromethane**	50(GV)	0.5	U	1	U	2	U	0.5	U
75-25-2	**Bromoform**	50(GV)	1	U	2	U	2	U	2	U
74-83-9	**Bromomethane**	5	2	U	4	U	4	U	5	U
75-15-0	**Carbon Disulfide**	NS	4	U	8	U	8	U	4	U
56-23-5	**Carbon Tetrachloride**	5	5	U	10	U	10	U	5	U
108-90-7	**Chlorobenzene**	5	1	U	2	U	2	U	1	U
75-00-3	**Chloroethane**	5	2	U	4	U	4	U	5	U
67-66-3	**Chloroform**	7	2	U	4	U	4	U	2	U
74-87-3	**Chloromethane**	5	1	U	4	U	4	U	5	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	2	U	2	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	5	U	1	U	1	U	0.5	U
10061-02-6	**trans-1,3-Dichloropropene**		1	U	2	U	1	U	0.5	U
110-82-7	**Cyclohexane**	NS	2	U	10	U	10	U		
124-48-1	**Dibromochloromethane**	50(GV)	2	U	1	U	1	U	2	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	2	U	4	U (V-05)	4	U	2	U
75-09-2	**Dichloromethane**	5								
64-17-5	**Ethanol (ug/L)**	NS			100	U	100	U (V-05)		
100-41-4	**Ethyl Benzene**	5	1	U	2	U	2	U	1	U
98-82-8	**Isopropylbenzene**	5	1	U	2	U	2	U	1	U
79-20-9	**Methyl Acetate**	NS	1	U (V-05)	2	U	4	U	1	U (L-04, V-05)
1634-04-4	**Methyl tert-butyl ether**	10(GV)	**4.8**		**6.7**		**4**		1	U (L-04, V-05)
108-88-3	**Methylbenzene**	5								
108-87-2	**Methylcyclohexane**	50	1	U	2	U	2	U	1	U
75-09-2	**Methylene chloride**	5	5	U	10	U	10	U	5	U
179601-23-1	**m/p-Xylenes**	5	2	U	4	U	4	U	2	U
95-47-6	**o-Xylenes**	5	1	U	2	U	2	U	1	U
100-42-5	**Styrene**	5	1	U	2	U	2	U	1	U
127-18-4	**Tetrachloroethene**	5	0.5	U	2	U	2	U	1	U
108-88-3	**Toluene**	5	1	U	2	U	2	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U	2	U	1	U (L-04, V-05)
79-01-6	**Trichloroethene**	5	1	U	2	U	2	U	**4.8**	
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	2	U	4	U	4	U	2	U
75-01-4	**Vinyl chloride**	2	2	U	4	U	4	U	2	U
	Total detected CVOCs	NS	**156**		**145**		**129**		**29.6**	
	Total detected VOCs	NS	**160.7**		**152.1**		**133.4**		**29.6**	
	Acetic Acid (ug/L)	NS	NA		290	U	290	U	5,800	U

	Well ID	TW-1S (2)		TW-1S		TW-1I (2)		TW-1I		TW-1D (2)		TW-1D (DUP) (2)	
	Date	12/5/2012		6/17/2015 (5)		12/6/2012		6/17/2015 (5)		12/5/2012		12/5/2012	
	Screen Interval (ft bgs)	15-20		15-20		25-35		25-35		55-60		55-60	
	Area	Area B		Area B		Area B		Area B		Area B		Area B	
CAS No.	***VOC (µg/l)***												
71-55-6	**1,1,1-Trichloroethane**	**31,000**	**D**	**17,200**		**270**	**D**	100	U	**5.8**		**6.3**	
79-34-5	**1,1,2,2-Tetrachloroethane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
79-00-5	**1,1,2-Trichloroethane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
75-34-3	**1,1-Dichloroethane**	**190,000**	**D**	**101,200**		**8,600**	**D**	**1,200**		**72**		**73**	
75-35-4	**1,1-Dichloroethene**	**1,300**	**JD**	1,000	U	200	U	100	U	**0.80**	**J**	**0.85**	**J**
87-61-6	**1,2,3-Trichlorobenzene**			1,000	U			100	U				
120-82-1	**1,2,4-Trichlorobenzene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
106-93-4	**1,2-Dibromoethane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
95-50-1	**1,2-Dichlorobenzene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
107-06-2	**1,2-Dichloroethane**	**24,000**	**D**	**14,200**		**440**	**D**	**190**		**4.9**		**5.0**	
78-87-5	**1,2-Dichloropropane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
541-73-1	**1,3-Dichlorobenzene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
142-28-9	**1,3-Dichloropropane**												
106-46-7	**1,4-Dichlorobenzene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
123-91-1	**1,4-Dioxane**			100,000	U			10,000	U				
78-93-3	**2-Butanone (Methyl ethyl ketone)**	40,000	U	5,000	U	2,000	U	500	U	10	U	10	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	20,000	U	5,000	U	1,000	U	500	U	5	U	5	U
108-10-1	**4-Methyl-2-pentanone**	20,000	U	5,000	U	1,000	U	500	U	5	U	5	U
67-64-1	**Acetone**	40,000	U	5,000	U	2,000	U	500	U	10	U	10	U
71-43-2	**Benzene**	4,000	U	1,000	U	200	U	100	U	1.0	U	1.0	U
74-97-5	**Bromochloromethane**			1,000	U			100	U				
75-27-4	**Bromodichloromethane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
75-25-2	**Bromoform**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
74-83-9	**Bromomethane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
75-15-0	**Carbon Disulfide**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
56-23-5	**Carbon Tetrachloride**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
108-90-7	**Chlorobenzene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
75-00-3	**Chloroethane**	4,000	U	1,000	U	200	U	**7,100**		**22**		**23**	
67-66-3	**Chloroform**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
74-87-3	**Chloromethane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
156-59-2	**cis-1,2-Dichloroethene (3)**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
10061-02-6	**trans-1,3-Dichloropropene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
110-82-7	**Cyclohexane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
124-48-1	**Dibromochloromethane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
75-09-2	**Dichloromethane**												
64-17-5	**Ethanol (ug/L)**												
100-41-4	**Ethyl Benzene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
98-82-8	**Isopropylbenzene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
79-20-9	**Methyl Acetate**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
1634-04-4	**Methyl tert-butyl ether**	4,000	U	1,000	U	200	U	100	U	**4.4**		**4.2**	
108-88-3	**Methylbenzene**												
108-87-2	**Methylcyclohexane**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
75-09-2	**Methylene chloride**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
179601-23-1	**m/p-Xylenes**	8,000	U	2,000	U	400	U	200	U	2	U	2	U
95-47-6	**o-Xylenes**	8,000	U	1,000	U	400	U	100	U	2	U	2	U
100-42-5	**Styrene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
127-18-4	**Tetrachloroethene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
108-88-3	**Toluene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
79-01-6	**Trichloroethene**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	4,000	U	1,000	U	200	U	100	U	1	U	1	U
75-01-4	**Vinyl chloride**	4,000	U	1,000	U	200	U	100	U	**1.9**		**2.0**	
	Total detected CVOCs	**246,300**		**132,600**		**9,310**		**8,490**		**107**		**110**	
	Total detected VOCs	**246,300**		**132,600**		**9,310**		**8,490**		**111.8**		**112.4**	
	Acetic Acid (ug/L)	NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	TW-1D		TW-1D (dup)		TW-2S (2)		TW-2S		TW-2I (2)		TW-2I		TW-2D (2)		TW-2D		TW-3S (2)		TW-3S		TW-3I (2)	
	Date		6/17/2015 (5)		6/17/2015 (5)		12/10/2012		6/17/2015 (5)		12/11/2012		6/17/2015 (5)		12/10/2012		6/17/2015 (5)		12/5/2012		6/18/2015 (5)		12/6/2012	
	Screen Interval (ft bgs)		55-60		55-60		15-20		15-20		30-35		30-35		60-65		60-65		15-20		15-20		25-35	
	Area		Area B		Area B		Area C		Area C		Area C		Area C		Area C		Area C		Area A		Area A		Area A	
CAS No.	VOC (µg/l)																							
71-55-6	1,1,1-Trichloroethane	5	1	U	1	U	290,000	D	95,600		680,000	D	393,700	D	64		660	D	2,000	U	100	U	1	U
79-34-5	1,1,2,2-Tetrachloroethane	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
79-00-5	1,1,2-Trichloroethane	1	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
75-34-3	1,1-Dichloroethane	5	7.4		7.5	J	75,000	D	63,400		71,000	D	84,300		48		160		100,000	D	7,300		18	
75-35-4	1,1-Dichloroethene	5	1	U	1	U	49,000	D	2,000	U	110,000	D	900	J	11		1.1		2,000	U	100	U	1	U
87-61-6	1,2,3-Trichlorobenzene	5	1	U	1	U			2,000	U			1,000	U			1	U			100	U		
120-82-1	1,2,4-Trichlorobenzene	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
106-93-4	1,2-Dibromoethane	NS	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
95-50-1	1,2-Dichlorobenzene	3	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
107-06-2	1,2-Dichloroethane	0.6	1.5		1.6		5,000	U	2,000	U	10,000	U	1,000	U	1	U	1.8		2,700	D	1,600		1	J
78-87-5	1,2-Dichloropropane	1	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
541-73-1	1,3-Dichlorobenzene	3	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
142-28-9	1,3-Dichloropropane	5											1,000	U										
106-46-7	1,4-Dichlorobenzene	3	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
123-91-1	1,4-Dioxane	0.35	100	U	100	U			20,000	U			100,000	U			100	U			10,000	U		
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	5	U	5	U	50,000	U	10,000	U	100,000	U	5,000	U	10	U	5	U	10,000	U	500	U	5	U
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	5	U	5	U	25,000	U	10,000	U	50,000	U	5,000	U	5	U	5	U	2,000	U	500	U	1	U
108-10-1	4-Methyl-2-pentanone	NS	5	U	5	U	25,000	U	10,000	U	50,000	U	5,000	U	5	U	5	U	20,000	U	500	U	10	U
67-64-1	Acetone	50 (GV)	5	U	5	U	50,000	U	10,000	U	100,000	U	5,000	U	10	U	5	U	10,000	U	500	U	5.0	U
71-43-2	Benzene	1	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	20,000	U	100	U	10	U
74-97-5	Bromochloromethane	5	1	U	1	U			2,000	U	10,000	U	1,000	U			1	U			100	U		
75-27-4	Bromodichloromethane	50(GV)	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
75-25-2	Bromoform	50(GV)	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
74-83-9	Bromomethane	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
75-15-0	Carbon Disulfide	NS	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
56-23-5	Carbon Tetrachloride	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
108-90-7	Chlorobenzene	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
75-00-3	Chloroethane	5	6.2		6.0		5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	11,800		4.8	
67-66-3	Chloroform	7	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
74-87-3	Chloromethane	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
156-59-2	cis-1,2-Dichloroethene (3)	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
10061-01-5	cis-1,3-Dichloropropene	0.4	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
10061-02-6	trans-1,3-Dichloropropene		1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
110-82-7	Cyclohexane	NS	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
124-48-1	Dibromochloromethane	50(GV)	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
75-09-2	Dichloromethane	5																						
64-17-5	Ethanol (ug/L)	NS																						
100-41-4	Ethyl Benzene	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
98-82-8	Isopropylbenzene	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
79-20-9	Methyl Acetate	NS	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
1634-04-4	Methyl tert-butyl ether	10(GV)	2.5		2.4		5,000	U	2,000	U	10,000	U	1,000	U	13		14		2,000	U	100	U	0.86	J
108-88-3	Methylbenzene	5											1,000	U										
108-87-2	Methylcyclohexane	50	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
75-09-2	Methylene chloride	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
179601-23-1	m/p-Xylenes	5	1	U	1	U	10,000	U	4,000	U	10,000	U	2,000	U	1	U	2	U	2,000	U	200	U	2	U
95-47-6	o-Xylenes	5	1	U	1	U	10,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	2	U
100-42-5	Styrene	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
127-18-4	Tetrachloroethene	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
108-88-3	Toluene	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
156-60-5	trans-1,2-Dichloroethene (3)	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
79-01-6	Trichloroethene	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
75-69-4	Trichlorofluoromethane (CFC-11)	5	1	U	1	U	5,000	U	2,000	U	10,000	U	1,000	U	1	U	1	U	2,000	U	100	U	1	U
75-01-4	Vinyl chloride	2	0.95	J	0.88	J	5,000	U	2,000	U	10,000	U	1,000	U	1.5		1	U	2,000	U	100	U	1	U
	Total detected CVOCs	NS	16		16		414,000		159,000		861,000		478,900		125		823		102,700		20,700		24	
	Total detected VOCs	NS	19		18		414,000		159,000		861,000		478,900		137.5		836.9		102,700		20,700		25	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	TW-3I		TW-3D (2)		TW-3D		TW-4S (2)		TW-4S		TW-4I (2)		TW-4I		TW-4D (2)		TW-4D		TW-5S (2)		TW-5S	
	Date		6/17/2015 (5)		12/5/2012		6/17/2015 (5)		12/5/2012		6/17/2015 (5)		12/6/2012		6/18/2015 (5)		12/5/2012		6/17/2015 (5)		12/5/2012		6/18/2015 (5)	
	Screen Interval (ft bgs)		25-35		44-49		44-49		5-10		5-10		15-25		15-25		35-40		35-40		15-20		15-20	
	Area		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area A		Area B		Area B	
CAS No.	*VOC (µg/l)*																							
71-55-6	**1,1,1-Trichloroethane**	5	1	U	1	U	1	U	250	U	500	U	**1.7**		50	U	1	U	1	U	**720**	**D**	**470**	
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
75-34-3	**1,1-Dichloroethane**	5	**1.7**		**34**		**24**		**12,000**	**D**	**5,700**		**2,100**	**D**	**1,800**		**26**		**4.2**		**2,800**	**D**	**2,000**	
75-35-4	**1,1-Dichloroethene**	5	1	U	1	U	1	U	250	U	500	U	**0.6**	**J**	50	U	**0.6**	**J**	1	U	**110**	**D**	**53.2**	
87-61-6	**1,2,3-Trichlorobenzene**	5	1	U			1	U			500	U			50	U			1	U			20	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
106-93-4	**1,2-Dibromoethane**	NS	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
107-06-2	**1,2-Dichloroethane**	0.6	1	U	**2**		**1**		**2,000**	**D**	**1,200**		**490**	**D**	50	U	**8.3**		**2.3**		**400**	**D**	**280**	
78-87-5	**1,2-Dichloropropane**	1	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
142-28-9	**1,3-Dichloropropane**	5																	1	U				
106-46-7	**1,4-Dichlorobenzene**	3	1	U	1	U	1	U	250	U	500	U	1	U	**500**		1	U	1	U	40	U	20	U
123-91-1	**1,4-Dioxane**	0.35	100	U			100	U			50,000	U			5,000	U							2,000	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	5	U	5	U	5	U	1,300	U	2,500	U	**4.6**	**J**	250	U	10	U	5	U	400	U	100	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	5	U			5	U	250	U	2,500	U	1	U	250	U	1	U	5	U	200	U	100	U
108-10-1	**4-Methyl-2-pentanone**	NS	5	U	10	U	5	U	2,500	U	2,500	U	**3.5**	**J**	250	U	5.0	U	5	U	200	U	100	U
67-64-1	**Acetone**	50 (GV)	**4.6**	**J**	5	U	5	U	1,300	U	2,500	U	**17**		250	U	10	U	5	U	400	U	100	U
71-43-2	**Benzene**	1	1	U	10	U	1	U	2,500	U	500	U	1.0	U	50	U	**0.73**	**J**	1	U	40	U	20	U
74-97-5	**Bromochloromethane**	5	1	U			1	U			500	U			50	U			1	U			20	U
75-27-4	**Bromodichloromethane**	50(GV)	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
75-25-2	**Bromoform**	50(GV)	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
74-83-9	**Bromomethane**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
75-15-0	**Carbon Disulfide**	NS	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
56-23-5	**Carbon Tetrachloride**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
108-90-7	**Chlorobenzene**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
75-00-3	**Chloroethane**	5	**1.6**		**41**		**28.8**		**13,000**		**18,600**		**2,500**	**D**	**4,300**		**13**		**3.6**		40	U	20	U
67-66-3	**Chloroform**	7	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
74-87-3	**Chloromethane**	5	1	U	1	U	1	U	250	U	500	U	**0.66**	**J**	50	U	1	U	1	U	40	U	20	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	**19**		**5.6**		40	U	**19**	**J**
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
10061-02-6	**trans-1,3-Dichloropropene**		1	U	1	U	1	U	500	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
110-82-7	**Cyclohexane**	NS	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
124-48-1	**Dibromochloromethane**	50(GV)	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
75-09-2	**Dichloromethane**	5																						
64-17-5	**Ethanol (ug/L)**	NS																						
100-41-4	**Ethyl Benzene**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
98-82-8	**Isopropylbenzene**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
79-20-9	**Methyl Acetate**	NS	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1	U	**8.8**		**4.5**		250	U	500	U	**0.50**	**J**	50	U	**1.2**		**1.5**		40	U	20	U
108-88-3	**Methylbenzene**	5																					20	U
108-87-2	**Methylcyclohexane**	50	1	U	1	U	1	U	250	U	500	U	1.0	U	50	U	1	U	1	U	40	U	20	U
75-09-2	**Methylene chloride**	5	1	U	1	U	1	U	250	U	500	U	**8.3**		50	U	1	U	1	U	40	U	20	U
179601-23-1	**m/p-Xylenes**	5	2	U	1	U	2	U	500	U	1,000	U	2	U	100	U	2	U	2	U	80	U	40	U
95-47-6	**o-Xylenes**	5	1	U	1	U	1	U	500	U	500	U	2	U	50	U	2	U	1	U	80	U	20	U
100-42-5	**Styrene**	5	1	U	1	U	1	U	500	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
127-18-4	**Tetrachloroethene**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
108-88-3	**Toluene**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
79-01-6	**Trichloroethene**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	**2.2**		1	U	**650**	**D**	**420**	
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	1	U	1	U	1	U	250	U	500	U	1	U	50	U	1	U	1	U	40	U	20	U
75-01-4	**Vinyl chloride**	2	1	U	1	U	1	U	250	U	500	U	**1.9**		50	U	**17**		**5.8**		40	U	**13.8**	**J**
	Total detected CVOCs	NS	**3.3**		**77**		**54**		**27,000**		**25,500**		**5,103**		**6,600**		**87.3**		**21.5**		**4,680**		**3,256**	
	Total detected VOCs	NS	**7.9**		**85.5**		**58.6**		**27,000**		**25,500**		**5,129**		**6,600**		**88**		**23**		**4,680**		**3,255.8**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	TW-5D (2)		TW-5D		TW-6S (2)		TW-6S		TW-6I (2)		TW-6I		TW-6D (2)		TW-6D		TW-7S (2)		TW-7S		TW-7S (dup)	
	Date		12/5/2012		6/18/2015 (5)		12/10/2012		6/17/2015 (5)		12/10/2012		6/17/2015 (5)		12/10/2012		6/17/2015 (5)		12/7/2012		6/18/2015 (5)		6/18/2015 (5)	
	Screen Interval (ft bgs)		25-35		25-35		15-20		15-20		30-35		30-35		50-55		50-55		15-20		15-20		15-20	
	Area		Area B		Area B		Area A		Area A		Area A		Area A		Area A		Area A		Area B		Area B		Area B	
CAS No.	*VOC (µg/l)*																							
71-55-6	**1,1,1-Trichloroethane**	5	1	U	1	U	8,000	U	2,000	U	**11**		20	U	**1**		50	U	**100,000**	**D**	**28,900**		**28,100**	
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
75-34-3	**1,1-Dichloroethane**	5	**14**		**5**		**420,000**	**D**	**260,900**		**19**		**1,300**		**230**	**D**	**2,000**		**12,000**	**D**	**5,200**		**5,300**	
75-35-4	**1,1-Dichloroethene**	5	1	U	1	U	8,000	U	2,000	U	**2.3**		20	U	1	U	50	U	**20,000**	**D**	**490**		**500**	
87-61-6	**1,2,3-Trichlorobenzene**	5			1	U			2,000	U			20	U	1	U	50	U			400	U	400	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
106-93-4	**1,2-Dibromoethane**	NS	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
107-06-2	**1,2-Dichloroethane**	0.6	1	U	1	U	**5,200**	**DJ**	**6,800**		1	U	20	U	**2.7**		50	U	2,000	U	400	U	400	U
78-87-5	**1,2-Dichloropropane**	1	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
142-28-9	**1,3-Dichloropropane**	5	1	U	1	U									1	U								
106-46-7	**1,4-Dichlorobenzene**	3	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
123-91-1	**1,4-Dioxane**	0.35			100	U			200,000	U			2,000	U	1	U	5,000	U			40,000	U	40,000	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	10	U	5	U	80,000	U	10,000	U	10	U	100	U	1	U	250	U	20,000	U	2,000	U	2,000	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	5	U	5	U	40,000	U	10,000	U	5	U	100	U	1	U	250	U	10,000	U	2,000	U	2,000	U
108-10-1	**4-Methyl-2-pentanone**	NS	5	U	5	U	40,000	U	10,000	U	5	U	100	U	1	U	250	U	10,000	U	2,000	U	2,000	U
67-64-1	**Acetone**	50 (GV)	10	U	5	U	80,000	U	10,000	U	10	U	100	U	1	U	250	U	20,000	U	2,000	U	2,000	U
71-43-2	**Benzene**	1	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
74-97-5	**Bromochloromethane**	5			1	U			2,000	U			20	U	1	U	50	U			400	U	400	U
75-27-4	**Bromodichloromethane**	50(GV)	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
75-25-2	**Bromoform**	50(GV)	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
74-83-9	**Bromomethane**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
75-15-0	**Carbon Disulfide**	NS	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
56-23-5	**Carbon Tetrachloride**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
108-90-7	**Chlorobenzene**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
75-00-3	**Chloroethane**	5	1	U	1	U	8,000	U	**2,100**		1	U	**110**		**1.9**		**63.2**		2,000	U	400	U	400	U
67-66-3	**Chloroform**	7	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
74-87-3	**Chloromethane**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
10061-02-6	**trans-1,3-Dichloropropene**		1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
110-82-7	**Cyclohexane**	NS	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
124-48-1	**Dibromochloromethane**	50(GV)	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
75-09-2	**Dichloromethane**	5																						
64-17-5	**Ethanol (ug/L)**	NS																						
100-41-4	**Ethyl Benzene**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
98-82-8	**Isopropylbenzene**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
79-20-9	**Methyl Acetate**	NS	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	**9.0**		**3.6**		8,000	U	2,000	U	1	U	20	U	**3.7**		50	U	2,000	U	400	U	400	U
108-88-3	**Methylbenzene**	5			1	U							20	U										
108-87-2	**Methylcyclohexane**	50			1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
75-09-2	**Methylene chloride**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
179601-23-1	**m/p-Xylenes**	5	2	U	2	U	16,000	U	4,000	U	2	U	40	U	1	U	100	U	4,000	U	800	U	800	U
95-47-6	**o-Xylenes**	5	2	U	1	U	16,000	U	2,000	U	2	U	20	U	1	U	50	U	4,000	U	400	U	400	U
100-42-5	**Styrene**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
127-18-4	**Tetrachloroethene**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
108-88-3	**Toluene**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
79-01-6	**Trichloroethene**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	1	U	1	U	8,000	U	2,000	U	1	U	20	U	1	U	50	U	2,000	U	400	U	400	U
75-01-4	**Vinyl chloride**	2	1	U	1	U	**11,000**	**D**	2,000	U	1	U	20	U	**6.3**		50	U	2,000	U	400	U	400	U
	Total detected CVOCs	NS	**14**		**5**		**436,200**		**269,800**		**32**		**1,410**		**242**		**2,063**		**132,000**		**34,590**		**33,900**	
	Total detected VOCs	NS	**23**		**8.6**		**436,200**		**269,800**		**32**		**1,410**		**246**		**2,063**		**132,000**		**34,590**		**33,900**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	TW-7I (2)		TW-7I		TW-7D (2)		TW-7D (dup) (2)		TW-7D		X-PROP-MWS (2)		X-PROP-MWS		X-PROP-MWI (2)		X-PROP-MWI		X-PROP-MWD (2)		X-PROP-MWD	
	Date		12/10/2012		6/18/2015 (5)		12/7/2012		12/7/2012		6/18/2015 (5)		12/6/2012		6/18/2015 (5)		12/10/2012		6/18/2015 (5)		12/6/2012		6/18/2015 (5)	
	Screen Interval (ft bgs)		30-35		30-35		52-57		52-57		52-57		15-20		15-20		25-30		25-30		37.5-42.5		37.5-42.5	
	Area		Area B		Area B		Area B		Area B		Area B		Area B/C		Area B/C		Area B/C		Area B/C		Area B/C		Area B/C	
CAS No.	***VOC (µg/l)***																							
71-55-6	**1,1,1-Trichloroethane**	5	**400**	**D**	**560**	**D**	1	U	1	U	1	U	**750,000**	**D**	**492,900**		**2,100**	**D**	**51,200**		**39**		**22.2**	
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
79-00-5	**1,1,2-Trichloroethane**	1	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
76-13-1	**1,1,2-Trichlorotrifluoroethane (Freon 113)**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
75-34-3	**1,1-Dichloroethane**	5	**68**		**760**	**D**	**5.8**		**5.8**		**1.1**		**85,000**	**D**	**33,300**		**3,700**	**D**	**5,800**		**21.0**		**10.1**	
75-35-4	**1,1-Dichloroethene**	5	**67**		**13.1**		1	U	1	U	1	U	**28,000**	**D**	5,000	U	**390**	**D**	500	U	**2.6**		1	U
87-61-6	**1,2,3-Trichlorobenzene**	5			1	U					1	U			5,000	U			500	U			1	U
120-82-1	**1,2,4-Trichlorobenzene**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
96-12-8	**1,2-Dibromo-3-Chloropropane**	0.04	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
106-93-4	**1,2-Dibromoethane**	NS	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
95-50-1	**1,2-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
107-06-2	**1,2-Dichloroethane**	0.6	**0.36**	**J**	**10.8**		1	U	1	U	1	U	20,000	U	5,000	U	**140**	**D**	500	U	**1.3**		1	U
78-87-5	**1,2-Dichloropropane**	1	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
541-73-1	**1,3-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
142-28-9	**1,3-Dichloropropane**	5																						
106-46-7	**1,4-Dichlorobenzene**	3	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
123-91-1	**1,4-Dioxane**	0.35	1	U	100	U					100	U			500,000	U			50,000	U			100	U
78-93-3	**2-Butanone (Methyl ethyl ketone)**	50(GV)	10	U	5	U	10	U	10	U	5	U	200,000	U	25,000	U	500	U	2,500	U	10	U	5	U
591-78-6	**2-Hexanone (methyl n-butyl ketone)**	50	5.0	U	5	U	5.0	U	5.0	U	5	U	100,000	U	25,000	U	250	U	2,500	U	5	U	5	U
108-10-1	**4-Methyl-2-pentanone**	NS	5.0	U	5	U	5.0	U	5.0	U	5	U	100,000	U	25,000	U	250	U	2,500	U	5	U	5	U
67-64-1	**Acetone**	50 (GV)	10	U	5	U	10	U	10	U	5	U	200,000	U	25,000	U	500	U	2,500	U	10	U	5	U
71-43-2	**Benzene**	1	1.0	U	1	U	1.0	U	1.0	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
74-97-5	**Bromochloromethane**	5			1	U					1	U			5,000	U			500	U			1	U
75-27-4	**Bromodichloromethane**	50(GV)	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
75-25-2	**Bromoform**	50(GV)	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
74-83-9	**Bromomethane**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
75-15-0	**Carbon Disulfide**	NS	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
56-23-5	**Carbon Tetrachloride**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
108-90-7	**Chlorobenzene**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
75-00-3	**Chloroethane**	5	1	U	**0.47**	**J**	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
67-66-3	**Chloroform**	7	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
74-87-3	**Chloromethane**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
156-59-2	**cis-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
10061-02-6	**trans-1,3-Dichloropropene**		1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
110-82-7	**Cyclohexane**	NS	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
124-48-1	**Dibromochloromethane**	50(GV)	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
75-71-8	**Dichlorodifluoromethane (cfc-12)**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
75-09-2	**Dichloromethane**	5																						
64-17-5	**Ethanol (ug/L)**	NS																						
100-41-4	**Ethyl Benzene**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
98-82-8	**Isopropylbenzene**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
79-20-9	**Methyl Acetate**	NS	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1	U	1	U	**8.2**		**8.4**		**6.4**		20,000	U	5,000	U	50	U	500	U	1	U	**2.5**	
108-88-3	**Methylbenzene**	5																						
108-87-2	**Methylcyclohexane**	50	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
75-09-2	**Methylene chloride**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	**5,800**		50	U	500	U	1	U	1	U
179601-23-1	**m/p-Xylenes**	5	1	U	2	U	2	U	2	U	2	U	40,000	U	10,000	U	100	U	1,000	U	2	U	1	U
95-47-6	**o-Xylenes**	5	1	U	1	U	2	U	2	U	1	U	40,000	U	5,000	U	100	U	500	U	2	U	1	U
100-42-5	**Styrene**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
127-18-4	**Tetrachloroethene**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
108-88-3	**Toluene**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
156-60-5	**trans-1,2-Dichloroethene (3)**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
79-01-6	**Trichloroethene**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
75-69-4	**Trichlorofluoromethane (CFC-11)**	5	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	50	U	500	U	1	U	1	U
75-01-4	**Vinyl chloride**	2	**1.6**		**0.50**	**J**	1	U	1	U	1	U	20,000	U	5,000	U	**91**		500	U	1	U	1	U
	Total detected CVOCs	NS	**537**		**1,345**		**6**		**6**		**1**		**863,000**		**532,000**		**6,421**		**57,000**		**64**		**32**	
	Total detected VOCs	NS	**537**		**1,345**		**14**		**14**		**8**		**863,000**		**532,000**		**6,421**		**57,000**		**64**		**35**	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

	Well ID	AWQS/GV	Y-PROP-MWS (2)		Y-PROP-MWS		Y-PROP-MWI (2)		Y-PROP-MWI		Y-PROP-MWI (dup)		Y-PROP-MWD (2)		Y-PROP-MWD		Z-PROP-MWS (2)		Z-PROP-MWS		Z-PROP-MWI (2)		Z-PROP-MWI		Z-PROP-MWD (2)		Z-PROP-MWD	
	Date		12/7/2012		6/18/2015 (5)		12/17/2012		6/17/2015 (5)		6/17/2015 (5)		12/7/2012		6/18/2015 (5)		12/6/2012		6/17/2015 (5)		12/10/2012		6/17/2015 (5)		12/6/2012		6/17/2015 (5)	
	Screen Interval (ft bgs)		15-20		15-20		35-40		35-40		35-40		52.5-57.5		52.5-57.5		15-20		15-20		35-40		35-40		55-60		55-60	
	Area		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C	
CAS No.	VOC (µg/l)																											
71-55-6	1,1,1-Trichloroethane	5	550,000	D	234,100		33		19.9		19.7		44.0		28.9		910,000	D	706,800		130	D	860		49		290	D
79-34-5	1,1,2,2-Tetrachloroethane	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
79-00-5	1,1,2-Trichloroethane	1	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
76-13-1	1,1,2-Trichlorotrifluoroethane (Freon 113)	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
75-34-3	1,1-Dichloroethane	5	140,000	D	68,500		200	D	52.9		59.8		2.8		12.2		190,000	D	140,700		54		510		21		130	
75-35-4	1,1-Dichloroethene	5	32,000	D	2,000	U	7		0.65	J	0.75	J	1	U	1	U	44,000	D	5,000	U	23		20	U	3.6		0.83	J
87-61-6	1,2,3-Trichlorobenzene	5			2,000	U			1	U	1	U			1	U			5,000	U			20	U			1	U
120-82-1	1,2,4-Trichlorobenzene	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.04	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
106-93-4	1,2-Dibromoethane	NS	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
95-50-1	1,2-Dichlorobenzene	3	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
107-06-2	1,2-Dichloroethane	0.6	10,000	U	2,800		1.2		1	U	1	U	10	U	1	U	20,000	U	8,600		1.1		20	U	0.91	J	5.50	
78-87-5	1,2-Dichloropropane	1	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
541-73-1	1,3-Dichlorobenzene	3	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
142-28-9	1,3-Dichloropropane	5																										
106-46-7	1,4-Dichlorobenzene	3	10,000	U	2,000	U	1	U	1	U	1	U	1.4		1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
123-91-1	1,4-Dioxane	0.35			200,000	U			100	U	100	U			100	U			500,000	U			2,000	U			100	U
78-93-3	2-Butanone (Methyl ethyl ketone)	50(GV)	100,000	U	10,000	U	10	U	5	U	5	U	10	U	5	U	200,000	U	25,000	U	10	U	100	U	10	U	5	U
591-78-6	2-Hexanone (methyl n-butyl ketone)	50	50,000	U	10,000	U	5	U	5	U	5	U	5	U	5	U			25,000	U	5	U	100	U	5	U	5	U
108-10-1	4-Methyl-2-pentanone	NS	50,000	U	10,000	U	5	U	5	U	5	U	10	U	5	U	100,000	U	25,000	U	5	U	100	U	5	U	5	U
67-64-1	Acetone	50 (GV)	100,000	U	10,000	U	10	U	5	U	5	U	10	U	5	U	200,000	U	25,000	U	10	U	100	U	10	U	5	U
71-43-2	Benzene	1	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
74-97-5	Bromochloromethane	5			2,000	U			1	U	1	U			1	U			5,000	U			20	U			1	U
75-27-4	Bromodichloromethane	50(GV)	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
75-25-2	Bromoform	50(GV)	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
74-83-9	Bromomethane	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
75-15-0	Carbon Disulfide	NS	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
56-23-5	Carbon Tetrachloride	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
108-90-7	Chlorobenzene	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
75-00-3	Chloroethane	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	14		3	
67-66-3	Chloroform	7	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
74-87-3	Chloromethane	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
156-59-2	cis-1,2-Dichloroethene (3)	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
10061-01-5	cis-1,3-Dichloropropene	0.4	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
10061-02-6	trans-1,3-Dichloropropene		10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
110-82-7	Cyclohexane	NS	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
124-48-1	Dibromochloromethane	50(GV)	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
75-71-8	Dichlorodifluoromethane (cfc-12)	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
75-09-2	Dichloromethane	5																										
64-17-5	Ethanol (ug/L)	NS																										
100-41-4	Ethyl Benzene	5	10,000	U	2,000	U	1	U	1	U	1	U	14		1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
98-82-8	Isopropylbenzene	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
79-20-9	Methyl Acetate	NS	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
1634-04-4	Methyl tert-butyl ether	10(GV)	10,000	U	2,000	U	1	U	1	U	1	U	1	U	12.3		20,000	U	5,000	U	1	U	20	U	7.0		2.5	
108-88-3	Methylbenzene	5																										
108-87-2	Methylcyclohexane	50	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
75-09-2	Methylene chloride	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
179601-23-1	m/p-Xylenes	5	20,000	U	4,000	U	2	U	2	U	2	U	1	U	2	U	40,000	U	10,000	U	2	U	40	U	2	U	2	U
95-47-6	o-Xylenes	5	20,000	U	2,000	U	2	U	1	U	1	U	1	U	1	U	40,000	U	5,000	U	2	U	20	U	2	U	1	U
100-42-5	Styrene	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
127-18-4	Tetrachloroethene	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
108-88-3	Toluene	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
156-60-5	trans-1,2-Dichloroethene (3)	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
79-01-6	Trichloroethene	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
75-69-4	Trichlorofluoromethane (CFC-11)	5	10,000	U	2,000	U	1	U	1	U	1	U	1	U	1	U	20,000	U	5,000	U	1	U	20	U	1	U	1	U
75-01-4	Vinyl chloride	2	10,000	U	2,000	U	4.9		0.29	J	1	U	75.2		1	U	20,000	U	5,000	U	1.6		20	U	1	U	1	U
	Total detected CVOCs	NS	722,000		305,400		246		73.7		80		123		41		1,144,000		856,100		210		1,370		89		429	
	Total detected VOCs	NS	722,000		305,400		246		73.7		80		137		53		1,144,000		856,100		210		1,370		96		432	
	Acetic Acid (ug/L)	NS	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

Notes:
See page 34 (last page) of Table 2-2 for notes.

Table 2-2
Groundwater Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

NOTES:

A. Some monitoring wells do not have analytical data for several monitoring rounds due to clogging of screens (silt) and/or well being dry due to heating conditions. Details for each round below:
- July 2016: SOG G-8 - dry; SOG C-2 & SOG C-6 clogged with silt.
- Sept 2016: SOG wells G-4, A-2, C-6, G-8, K-8 all dry.
- Dec 2016: SOG wells G-8, I-10, C-6, G-5, K-8, F-9, E-6 dry or blocked due to silting.
- Feb 2017: SOG wells A-2, C-2, C-6, F-9, G-4, G-8, I-10, K-8 dry or blocked due to silting.
- April 2017: SOG wells F-9, M-12, G-8 dry or blocked due to silting.

B. Concentrations in these wells expected to be lower than nearest shallow screened monitoring well. SOG screens: Area A = 8.5 to 23 ft bgs; Area B = 8.5 to 33 ft bgs; Area C = 8.5 to 53 ft bgs. Sample tubing placed at approximately 20-ft for gw sampling as 15-20 feet bgs is the interval with the highest CVOC concentrations in the MHBP area.

C. Historical Data Details
(1) Data collected between August 1 to 11, 1995. Lab reports unavailable. Data presented originates from data tables.
(2) Original estimated aqueous phase CVOC mass based on 2011/2012 data for the following wells:
MCH-30, TW-5, DG TW-5+ MW-30, X-Prop-MW, Y-Prop-MW, TW-7, DG TW-7, MHBP-11, MHBP-12, MHC-29, Z-prop-MW, TW-2, TW-1, TW-6, TW-4, TW-3, MHBP-8, MHBP-13
(3) 1995 data reported as total 1,2-DCE in data tables. Source: "Chazen 1998 Supplemental RI"
(4) Data from "Table 2-Post EISB Performance Monitoring NEW". Lab data available for 11/2012, 12/2012.
(5) Baseline Groundwater Data for ERH Treatment obtained in June 2015. Data obtained from laboratory pivot tables.
<u>Grey Shaded</u>:
(a) 1995 Data: Data presented from tables in Chazen 1998 Supplemental RI. Report stated groundwater analyzed via EPA 8240B. 1995 data lab reports not available.
(b) 2005, 2006, 2007 Data: Data source is data tables from O&G 2007 Final RI report, August 2007. No laboratory report available. Data for parameter not listed.
(c) BIW/MHC 2014 well data from "Table 2-Post EISB Performance Monitoring NEW": Data not located in the data table provided and lab report not available.

D. Acronyms, qualifier definitions and bold/shading definitions:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
VOCs-Volatile Organic Compound; CVOCs-Chlorinated Volatile Organic Compound
µg/l - micrograms per liter
U/ND - The compound was not detected at a concentration greater than or equal to the MDL.
J - The concentration given is an approximate value. The concentration is less than the reporting limit (RL) and greater than or equal to the MDL.
D - The reported value is from a secondary analysis with a dilution factor. The original analysis exceeded the calibration range.
E - The compound concentration exceeded the calibration range.
NA - not analyzed
NS - no standard available
* Laboratory control sample (LCS) or LCS Duplicate (LCSD) exceeds the control limits.
^ - Instrument related QC is outside acceptance limit
V-05 - Continuing calibration did not meet method specifications and was biased on the low side.
R-05 - Laboratory fortified blank duplicate RPD is outside of control limits. Reduced precision is anticipated for any reported value for this compound.
L-04 - Laboratory fortified blank/laboratory control sample recovery and duplicate recovery are outside of control limits. Reported value for this compound is likely to be biased on the low side.

E. Ethanol analysis began in December 2016. December 2016/February 2016 analyzed via Method SW-846 8260C. April 2017 ethanol was analyzed via SW-846 8260C and SW-846 8015C. If two methods were used, the higher of the result was reported in this table. Unestimated values are reported over estimated values.

F. Well material/abandonment/replacement details:
- June 2015. MHBP-11, MHBP-12 covered with HDPE liner and replaced with FRP.
- Abandoned wells: MHBP-13D abandoned post March 2011; TW-1S, -1I, -1D; TW-2S, -2I, -2D; TW-3S, -3I, -3D; TW-4S, -4I, -4D; TW-5D; TW-6S, -6I, -6D; X-PROP-MWS, -MWI, -MWD; Y-PROP-MWS, -MWI, -MWD; Z-PROP-MWS, -MWI, -MWD.
- PVC wells: MHBP-21, OBG-7S, OBG-7I, OBG-7D, OBG-8S
- PVC replaced with FRP: MHC-29, MHBP-13S.

Table 2-3
Soil Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	GP-14		GP-15		GP-16		GP-17		GP-18		GP-19		OBG 06S		OBG 07I		OBG 07S		OBG 08S		SS-7		SS-8		SS-8 (duplicate)		SS-9		SS-10		SS-11		SS-12		SS-13		MHC-B1	
Date					6/22/2005		6/23/2005		6/23/2005		6/23/2005		6/23/2005		6/23/2005		8/17/2005		8/23/2005		8/22/2005		8/19/2005		3/28/2007		3/28/2007		3/28/2007		3/27/2007		3/28/2007		3/27/2007		3/28/2007		3/27/2007		1998	
Depth					4-6 ft		16-20		20-24		16-20		16-20		19-23		no data		36-42		8-10		6-8 ft		0-2 inch		0-2 inch		0-2 inch		0-2 inch		0-2 inch		0-2 inch		0-2 inch		0-2 inch		2-4 feet	
Area		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	Area A		Area A		Area B		Area C		Area B		Area C		75 ft west of Area B		50 ft west of Area B		50 ft west of Area B		Area A		30 ft N of Area B		Area C		Area C		Area C		Area B		Area A		30 ft east of Area A		50 ft south of Area A		Area C	
CAS No.	VOC (mg/Kg) (1)			mg/kg																																						
630-20-6	1,1,1,2-Tetrachloroethane	NS	NS	NS																																						
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	1.8		0.03		34.0			U	0.014	J	46.0			U		U		U		U	0.0048	J		U		U		U		U		U		U		U		U
79-34-5	1,1,2,2-Tetrachloroethane	NS	NS	NS		U		U		U		U		U		U		U		U		U		U	0.008	R		U		U		U		U		U		U		U		U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	NS																																						U
79-00-5	1,1,2-Trichloroethane	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
75-34-3	1,1-Dichloroethane	0.27	240	0.27	0.02		6.9		29.0		1.5	J	0.0058	J	8.7			U		U		U		U		U		U		U		U		U		U		U		U		U
75-35-4	1,1-Dichloroethene	0.33	500	0.33	0.14		0.27	J		U	0.0001	J		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
563-58-6	1,1-Dichloropropene	NS	NS	NS																						U		U		U		U		U		U		U		U		U
87-61-6	1,2,3-Trichlorobenzene	NS	NS	NS																					0.008	R		U		U		U		U		U		U		U		U
96-18-4	1,2,3-Trichloropropane	NS	NS	NS																					0.008	R		U		U		U		U		U		U		U		U
120-82-1	1,2,4-Trichlorobenzene	NS	NS	NS		U		U		U	0.006	R		U		U		U		U		U		U	0.008	R		U		U		U		U		U		U		U		U
95-63-6	1,2,4-Trimethylbenzene	3.6	4	3.6																					0.008	R		U		U		U		U		U		U		U		U
96-12-8	1,2-Dibromo-3-chloropropane	NS	NS	NS		U		U		U	0.0063	R		U		U		U		U		U		U	0.008	R		U		U		U		U		U		U		U		U
106-93-4	1,2-Dibromoethane	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
95-50-1	1,2-Dichlorobenzene	1.1	500	1.1		U		U		U	0.0032	R		U		U		U		U		U		U	0.008	R		U		U		U		U		U		U		U		U
107-06-2	1,2-Dichloroethane	0.02	30	0.02	9.7		4.4		15.0		0.002	J	0.0006	J		U		U		U		U		U		U		U		U		U		U		U		U		U		U
78-87-5	1,2-Dichloropropane	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
108-67-8	1,3,5-Trimethylbenzene	8.4	8	8.4																						U		U		U		U		U		U		U		U		U
541-73-1	1,3-Dichlorobenzene	2.4	280	2.4																						U		U		U		U		U		U		U		U		U
142-28-9	1,3-Dichloropropane	NS	NS	NS																						U		U		U		U		U		U		U		U		U
106-46-7	1,4-Dichlorobenzene	1.8	130	1.8						U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
123-91-1	1,4-Dioxane	0.1	130	0.1																																						
594-20-7	2,2-Dichloropropane	NS	NS	NS																						U		U		U		U		U		U		U		U		U
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	0.043	J	6.1	U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
95-49-8	2-Chlorotoluene	NS	NS	NS																					0.008	R		U		U		U		U		U		U		U		U
591-78-6	2-Hexanone (Methyl butyl ketone)	NS	NS	NS																																						U
106-43-4	4-Chlorotoluene	NS	NS	NS																						U		U		U		U		U		U		U		U		U
99-87-6	4-Isopropyltoluene	NS	NS	NS																						U		U		U		U		U		U		U		U		U
108-10-1	4-Methyl-2-pentanone	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
67-64-1	Acetone	0.05	500	0.05		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
107-13-1	Acrylonitrile	NS	NS	NS																																						
71-43-2	Benzene	0.06	44	0.06		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
108-86-1	Bromobenzene	NS	NS	NS																						U		U		U		U		U		U		U		U		U
74-97-5	Bromochloromethane	NS	NS	NS																						U		U		U		U		U		U		U		U		U
75-27-4	Bromodichloromethane	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
75-25-2	Bromoform	NS	NS	NS																						U		U		U		U		U		U		U		U		U
74-83-9	Bromomethane	NS	NS	NS																						U		U		U		U		U		U		U		U		U
75-15-0	Carbon disulfide	NS	NS	NS	0.014	J		U		U	0.001	J	0.001	J		U		U		U		U		U		U		U		U		U		U		U		U		U		U
56-23-5	Carbon tetrachloride	0.76	22	0.76		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
108-90-7	Chlorobenzene	1.1	500	1.1		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
75-00-3	Chloroethane	NA	NS	NA		U		U		U	0.004	J		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
67-66-3	Chloroform	0.37	350	0.37	0.030	J	0.061	J		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
74-87-3	Chloromethane	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
10061-01-5	cis-1,3-Dichloropropene	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
110-82-7	Cyclohexane	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
124-48-1	Dibromochloromethane	NS	NS	NS																																						U
74-95-3	Dibromomethane	NS	NS	NS																						U		U		U		U		U		U		U		U		U
75-71-8	Dichlorodifluoromethane	NS	NS	NS																																						U
60-29-7	Diethyl Ether	NS	NS	NS																																						
108-20-3	Diisopropyl Ether (DIPE)	NS	NS	NS																																						
100-41-4	Ethylbenzene	1.0	390	1.0		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
87-68-3	Hexachlorobutadiene	NS	NS	NS																					0.008	R		U		U		U		U		U		U		U		U
74-88-4	Iodomethane	NS	NS	NS																						U		U		U		U		U		U		U		U		U
98-82-8	Isopropylbenzene	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
1330-20-7	m,p-Xylene	0.26	0	0.26		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
79-20-9	Methyl acetate	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
1634-04-4	Methyl tert-butyl ether	0.93	500	0.93		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
108-87-2	Methylcyclohexane	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
75-09-2	Methylene chloride	0.05	500	0.05																																						U
104-51-8	n-Butylbenzene	12	12	12																						U		U		U		U		U		U		U		U		U
103-65-1	n-Propylbenzene	3.9	4	3.9																						U		U		U		U		U		U		U		U		U
91-20-3	Naphthalene	12	12	12																					0.007	J		U		U		U		U	0.021	J		U	0.024	J		U
95-47-6	o-Xylene	NS	0	NS																						U		U		U		U		U		U		U		U		U
99-87-6	p-Isopropyltoluene (p-Cymene)	NS	NS	NS																																						
135-98-8	sec-Butylbenzene	11	11	11																						U		U		U		U		U		U		U		U		U
100-42-5	Styrene	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
994-05-8	tert-Amyl Methyl Ether (TAME)	NS	NS	NS																																						
75-65-0	tert-Butyl Alcohol (TBA)	NS	NS	NS																																						
637-92-3	tert-Butyl Ethyl Ether (TBEE)	NS	NS	NS																																						
98-06-6	tert-Butylbenzene	5.9	6	5.9																					0.008	R		U		U		U		U		U		U		U		U
127-18-4	Tetrachloroethene	1.3	150	1.3		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
109-99-9	Tetrahydrofuran	NS	NS	NS																																						
108-88-3	Toluene	0.7	500	0.7		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
156-60-5	trans-1,2-Dichloroethene	0.19	500	0.19		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
10061-02-6	trans-1,3-Dichloropropene	NS	NS	NS		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
110-57-6	trans-1,4-Dichloro-2-butene	NS	NS	NS																																						
79-01-6	Trichloroethene	0.47	200	0.47		U		U		U		U		U		U		U		U		U		U	0.004	J		U		U		U		U		U		U		U		U
75-69-4	Trichlorofluoromethane	NS	NS	NS																																						U
108-05-4	Vinyl acetate	NS	NS	NS																						U		U		U		U		U		U		U		U		U
75-01-4	Vinyl chloride	0.02	13	0.02	0.016	J		U		U	0.005	J		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
1330-20-7	Xylene (Total)	1.6	500	1.6		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
Total VOC					11.77		17.76		78.00		1.53		0.021		54.7		ND		ND		ND		ND		0.0958		ND		ND		ND		ND		0.021		ND		0.024		ND	
Total CVOC					11.68		17.70		78.00		1.53		0.020		54.7		ND		ND		ND		ND		0.0728		ND		ND		ND		ND		0.000		ND		0.000		ND	

Notes:
See last page, page 8 for Notes.

Table 2-3
Soil Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	MHC-B2	MHC-B3	MHC-B4	MHC-B5	MHC-B6	MHC-B10	MHC-B11	MHC-B12	MHC-B15	MHC-B17	MHC-B19	MHC-B21	MHC-B24	MHC-B27	MHC-B33	MHC-B34	MHC-B36	SB-A	SB-A
Date					1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	August 2011	August 2011
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	2-4 feet	18-20 feet	2-4 feet	15-16 feet	25-26 feet
Area					Area C	Area B	Area B	Area C	Area A	Area A	Area A	Area A	Area C	Area B	Area A	Area C	Area A	Area B	Area B	Area B	Area B	Area B	Area B
CAS No.	VOC (mg/Kg) (1)			mg/kg																			
630-20-6	1,1,1,2-Tetrachloroethane	NS	NS	NS																			
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	U	0.003 J	0.004 J	0.003 J	0.002 J	0.0001 J	U	U	U	U	U	U	U	U	U	760	U	270	370
79-34-5	1,1,2,2-Tetrachloroethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
79-00-5	1,1,2-Trichloroethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
75-34-3	1,1-Dichloroethane	0.27	240	0.27	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	36 J	U	5.6	4.3
75-35-4	1,1-Dichloroethene	0.33	500	0.33	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
563-58-6	1,1-Dichloropropene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
87-61-6	1,2,3-Trichlorobenzene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
96-18-4	1,2,3-Trichloropropane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
120-82-1	1,2,4-Trichlorobenzene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
95-63-6	1,2,4-Trimethylbenzene	3.6	4	3.6	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
96-12-8	1,2-Dibromo-3-chloropropane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
106-93-4	1,2-Dibromoethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
95-50-1	1,2-Dichlorobenzene	1.1	500	1.1	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
107-06-2	1,2-Dichloroethane	0.02	30	0.02	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
78-87-5	1,2-Dichloropropane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
108-67-8	1,3,5-Trimethylbenzene	8.4	8	8.4	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
541-73-1	1,3-Dichlorobenzene	2.4	280	2.4	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
142-28-9	1,3-Dichloropropane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
106-46-7	1,4-Dichlorobenzene	1.8	130	1.8	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
123-91-1	1,4-Dioxane	0.1	130	0.1																			
594-20-7	2,2-Dichloropropane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
95-49-8	2-Chlorotoluene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
591-78-6	2-Hexanone (Methyl butyl ketone)	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
106-43-4	4-Chlorotoluene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
99-87-6	4-Isopropyltoluene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
108-10-1	4-Methyl-2-pentanone	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
67-64-1	Acetone	0.05	500	0.05	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
107-13-1	Acrylonitrile	NS	NS	NS																			
71-43-2	Benzene	0.06	44	0.06	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
108-86-1	Bromobenzene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
74-97-5	Bromochloromethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
75-27-4	Bromodichloromethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
75-25-2	Bromoform	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
74-83-9	Bromomethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
75-15-0	Carbon disulfide	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
56-23-5	Carbon tetrachloride	0.76	22	0.76	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
108-90-7	Chlorobenzene	1.1	500	1.1	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
75-00-3	Chloroethane	NA	NS	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
67-66-3	Chloroform	0.37	350	0.37	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
74-87-3	Chloromethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
10061-01-5	cis-1,3-Dichloropropene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
110-82-7	Cyclohexane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
124-48-1	Dibromochloromethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
74-95-3	Dibromomethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
75-71-8	Dichlorodifluoromethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
60-29-7	Diethyl Ether	NS	NS	NS																			
108-20-3	Diisopropyl Ether (DIPE)	NS	NS	NS																			
100-41-4	Ethylbenzene	1.0	390	1.0	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
87-68-3	Hexachlorobutadiene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
74-88-4	Iodomethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
98-82-8	Isopropylbenzene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
1330-20-7	m,p-Xylene	0.26	0	0.26	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
79-20-9	Methyl acetate	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
1634-04-4	Methyl tert-butyl ether	0.93	500	0.93	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
108-87-2	Methylcyclohexane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
75-09-2	Methylene chloride	0.05	500	0.05	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
104-51-8	n-Butylbenzene	12	12	12	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
103-65-1	n-Propylbenzene	3.9	4	3.9	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
91-20-3	Naphthalene	12	12	12	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
95-47-6	o-Xylene	NS	0	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
99-87-6	p-Isopropyltoluene (p-Cymene)	NS	NS	NS																			
135-98-8	sec-Butylbenzene	11	11	11	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
100-42-5	Styrene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
994-05-8	tert-Amyl Methyl Ether (TAME)	NS	NS	NS																			
75-65-0	tert-Butyl Alcohol (TBA)	NS	NS	NS																			
637-92-3	tert-Butyl Ethyl Ether (TBEE)	NS	NS	NS																			
98-06-6	tert-Butylbenzene	5.9	6	5.9	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
127-18-4	Tetrachloroethene	1.3	150	1.3	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
109-99-9	Tetrahydrofuran	NS	NS	NS																			
108-88-3	Toluene	0.7	500	0.7	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
156-60-5	trans-1,2-Dichloroethene	0.19	500	0.19	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
10061-02-6	trans-1,3-Dichloropropene	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
110-57-6	trans-1,4-Dichloro-2-butene	NS	NS	NS																			
79-01-6	Trichloroethene	0.47	200	0.47	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	2.2	2.4
75-69-4	Trichlorofluoromethane	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
108-05-4	Vinyl acetate	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
75-01-4	Vinyl chloride	0.02	13	0.02	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
1330-20-7	Xylene (Total)	1.6	500	1.6	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
Total VOC					ND	0.003	0.004	0.003	0.002	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	796	ND	277.8	376.7
Total CVOC					ND	0.003	0.004	0.003	0.002	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	796	ND	277.8	376.7

Notes:
See last page, page 8 for Notes.

Table 2-3
Soil Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	SB-A	SB-A	SB-B	SB-B	SB-B	SB-B	SB-B	SB-C	SB-C	SB-C	SB-C	SB-D	SB-D	SB-D	SB-D	SB-E	SB-E	SB-E	SB-E
Date					August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011	August 2011
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	35-35.5 feet	42-42.5 feet	17.5-18 feet	25-26 feet	32-33 feet	37-38 feet	45-46 feet	18-19 feet	30-31 feet	43-43.5 feet	50-51 feet	12-13 feet	20-21 feet	35-36 feet	42-42.5 feet	7-8 feet	13.5-14 feet	22-23 feet	32-33 feet
Area					Area B	Area B	Area B	Area B	Area B	Area B	Area B	Area C	Area C	Area C	Area C	Area B	Area B	Area B	Area B	Area C	Area C	Area C	Area C
CAS No.	VOC (mg/Kg) (1)			mg/kg																			
630-20-6	1,1,1,2-Tetrachloroethane	NS	NS	NS																			
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	0.0083	0.0084	460	0.0092	U	U	0.016	650	0.0067 U	U	U	180	29	0.0039	0.0031	U	500	68.0	0.021
79-34-5	1,1,2,2-Tetrachloroethane	NS	NS	NS																			
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	NS																			
79-00-5	1,1,2-Trichloroethane	NS	NS	NS																			
75-34-3	1,1-Dichloroethane	0.27	240	0.27	U	U	11	U	U	U	U	24	U	U	U	10	28	0.019	0.0083	U	14	41	0.0053
75-35-4	1,1-Dichloroethene	0.33	500	0.33	U	U	U	U	U	U	U	U	U	U	U	U	0.260	U	U	U	U	U	U
563-58-6	1,1-Dichloropropene	NS	NS	NS																			
87-61-6	1,2,3-Trichlorobenzene	NS	NS	NS																			
96-18-4	1,2,3-Trichloropropane	NS	NS	NS																			
120-82-1	1,2,4-Trichlorobenzene	NS	NS	NS																			
95-63-6	1,2,4-Trimethylbenzene	3.6	4	3.6																			
96-12-8	1,2-Dibromo-3-chloropropane	NS	NS	NS																			
106-93-4	1,2-Dibromoethane	NS	NS	NS																			
95-50-1	1,2-Dichlorobenzene	1.1	500	1.1																			
107-06-2	1,2-Dichloroethane	0.02	30	0.02	U	U	U	U	U	U	U	U	U	U	U	2	9	U	U	U	U	8.6	U
78-87-5	1,2-Dichloropropane	NS	NS	NS																			
108-67-8	1,3,5-Trimethylbenzene	8.4	8	8.4																			
541-73-1	1,3-Dichlorobenzene	2.4	280	2.4																			
142-28-9	1,3-Dichloropropane	NS	NS	NS																			
106-46-7	1,4-Dichlorobenzene	1.8	130	1.8																			
123-91-1	1,4-Dioxane	0.1	130	0.1																			
594-20-7	2,2-Dichloropropane	NS	NS	NS																			
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12																			
95-49-8	2-Chlorotoluene	NS	NS	NS																			
591-78-6	2-Hexanone (Methyl butyl ketone)	NS	NS	NS																			
106-43-4	4-Chlorotoluene	NS	NS	NS																			
99-87-6	4-Isopropyltoluene	NS	NS	NS																			
108-10-1	4-Methyl-2-pentanone	NS	NS	NS																			
67-64-1	Acetone	0.05	500	0.05	0.0096	0.015	U	0.0098	0.007	0.0056	0.011	U	U	0.0072	5.7	U	U	0.084	0.0056	0.0048	U	U	0.0091
107-13-1	Acrylonitrile	NS	NS	NS																			
71-43-2	Benzene	0.06	44	0.06																			
108-86-1	Bromobenzene	NS	NS	NS																			
74-97-5	Bromochloromethane	NS	NS	NS																			
75-27-4	Bromodichloromethane	NS	NS	NS																			
75-25-2	Bromoform	NS	NS	NS																			
74-83-9	Bromomethane	NS	NS	NS																			
75-15-0	Carbon disulfide	NS	NS	NS																			
56-23-5	Carbon tetrachloride	0.76	22	0.76	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
108-90-7	Chlorobenzene	1.1	500	1.1																			
75-00-3	Chloroethane	NA	NS	NA																			
67-66-3	Chloroform	0.37	350	0.37																			
74-87-3	Chloromethane	NS	NS	NS																			
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25																			
10061-01-5	cis-1,3-Dichloropropene	NS	NS	NS																			
110-82-7	Cyclohexane	NS	NS	NS																			
124-48-1	Dibromochloromethane	NS	NS	NS																			
74-95-3	Dibromomethane	NS	NS	NS																			
75-71-8	Dichlorodifluoromethane	NS	NS	NS																			
60-29-7	Diethyl Ether	NS	NS	NS																			
108-20-3	Diisopropyl Ether (DIPE)	NS	NS	NS																			
100-41-4	Ethylbenzene	1.0	390	1.0																			
87-68-3	Hexachlorobutadiene	NS	NS	NS																			
74-88-4	Iodomethane	NS	NS	NS																			
98-82-8	Isopropylbenzene	NS	NS	NS																			
1330-20-7	m,p-Xylene	0.26	0	0.26																			
79-20-9	Methyl acetate	NS	NS	NS	U	U	U	U	U	U	U	U	U	U	U	U	0.210	U	U	U	U	U	U
1634-04-4	Methyl tert-butyl ether	0.93	500	0.93																			
108-87-2	Methylcyclohexane	NS	NS	NS																			
75-09-2	Methylene chloride	0.05	500	0.05	U	U	U	U	U	U	U	U	U	0.004	U	U	U	U	U	U	U	U	U
104-51-8	n-Butylbenzene	12	12	12																			
103-65-1	n-Propylbenzene	3.9	4	3.9																			
91-20-3	Naphthalene	12	12	12																			
95-47-6	o-Xylene	NS	0	NS																			
99-87-6	p-Isopropyltoluene (p-Cymene)	NS	NS	NS																			
135-98-8	sec-Butylbenzene	11	11	11																			
100-42-5	Styrene	NS	NS	NS																			
994-05-8	tert-Amyl Methyl Ether (TAME)	NS	NS	NS																			
75-65-0	tert-Butyl Alcohol (TBA)	NS	NS	NS																			
637-92-3	tert-Butyl Ethyl Ether (TBEE)	NS	NS	NS																			
98-06-6	tert-Butylbenzene	5.9	6	5.9																			
127-18-4	Tetrachloroethene	1.3	150	1.3	U	U	U	U	U	U	0.001	U	U	U	U	U	U	U	U	U	U	U	U
109-99-9	Tetrahydrofuran	NS	NS	NS																			
108-88-3	Toluene	0.7	500	0.7																			
156-60-5	trans-1,2-Dichloroethene	0.19	500	0.19																			
10061-02-6	trans-1,3-Dichloropropene	NS	NS	NS																			
110-57-6	trans-1,4-Dichloro-2-butene	NS	NS	NS																			
79-01-6	Trichloroethene	0.47	200	0.47	U	U	U	U	U		U	U	U	U	U	U	0.180	U	U	U	U	U	U
75-69-4	Trichlorofluoromethane	NS	NS	NS																			
108-05-4	Vinyl acetate	NS	NS	NS																			
75-01-4	Vinyl chloride	0.02	13	0.02																			
1330-20-7	Xylene (Total)	1.6	500	1.6																			
Total VOC					0.0179	0.0234	471	0.019	0.007	0.0056	0.028	674	ND	0.0112	5.7	191.6	66.95	0.1069	0.017	0.0048	514	117.6	0.0354
Total CVOC					0.0083	0.0084	471	0.009	ND	ND	0.017	674	ND	0.0040	ND	191.6	66.95	0.0229	0.011	ND	514	117.6	0.0263

Notes:
See last page, page 8 for Notes.

Table 2-3
Soil Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	SB-E		SB-F		SB-F		SB-F		SB-F	
Date					August 2011		August 2011		August 2011		August 2011		August 2011	
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	42-42.5 feet		15-16 feet		21-22 feet		42-43 feet		50-51 feet	
Area					Area C		Area B		Area B		Area B		Area B	
CAS No.	VOC (mg/Kg) (1)			mg/kg										
630-20-6	1,1,1,2-Tetrachloroethane	NS	NS	NS										
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68		U	15		1,000		0.015		0.0019	
79-34-5	1,1,2,2-Tetrachloroethane	NS	NS	NS										
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	NS										
79-00-5	1,1,2-Trichloroethane	NS	NS	NS										
75-34-3	1,1-Dichloroethane	0.27	240	0.27		U	42		110		0.0038			U
75-35-4	1,1-Dichloroethene	0.33	500	0.33		U	1		69			U		U
563-58-6	1,1-Dichloropropene	NS	NS	NS										
87-61-6	1,2,3-Trichlorobenzene	NS	NS	NS										
96-18-4	1,2,3-Trichloropropane	NS	NS	NS										
120-82-1	1,2,4-Trichlorobenzene	NS	NS	NS										
95-63-6	1,2,4-Trimethylbenzene	3.6	4	3.6										
96-12-8	1,2-Dibromo-3-chloropropane	NS	NS	NS										
106-93-4	1,2-Dibromoethane	NS	NS	NS										
95-50-1	1,2-Dichlorobenzene	1.1	500	1.1										
107-06-2	1,2-Dichloroethane	0.02	30	0.02		U	2			U		U		U
78-87-5	1,2-Dichloropropane	NS	NS	NS										
108-67-8	1,3,5-Trimethylbenzene	8.4	8	8.4										
541-73-1	1,3-Dichlorobenzene	2.4	280	2.4										
142-28-9	1,3-Dichloropropane	NS	NS	NS										
106-46-7	1,4-Dichlorobenzene	1.8	130	1.8										
123-91-1	1,4-Dioxane	0.1	130	0.1										
594-20-7	2,2-Dichloropropane	NS	NS	NS										
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12										
95-49-8	2-Chlorotoluene	NS	NS	NS										
591-78-6	2-Hexanone (Methyl butyl ketone)	NS	NS	NS										
106-43-4	4-Chlorotoluene	NS	NS	NS										
99-87-6	4-Isopropyltoluene	NS	NS	NS										
108-10-1	4-Methyl-2-pentanone	NS	NS	NS										
67-64-1	Acetone	0.05	500	0.05	0.0079			U		U	0.0069		0.0081	
107-13-1	Acrylonitrile	NS	NS	NS										
71-43-2	Benzene	0.06	44	0.06										
108-86-1	Bromobenzene	NS	NS	NS										
74-97-5	Bromochloromethane	NS	NS	NS										
75-27-4	Bromodichloromethane	NS	NS	NS										
75-25-2	Bromoform	NS	NS	NS										
74-83-9	Bromomethane	NS	NS	NS										
75-15-0	Carbon disulfide	NS	NS	NS										
56-23-5	Carbon tetrachloride	0.76	22	0.76		U		U	110			U		U
108-90-7	Chlorobenzene	1.1	500	1.1										
75-00-3	Chloroethane	NA	NS	NA										
67-66-3	Chloroform	0.37	350	0.37										
74-87-3	Chloromethane	NS	NS	NS										
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25										
10061-01-5	cis-1,3-Dichloropropene	NS	NS	NS										
110-82-7	Cyclohexane	NS	NS	NS										
124-48-1	Dibromochloromethane	NS	NS	NS										
74-95-3	Dibromomethane	NS	NS	NS										
75-71-8	Dichlorodifluoromethane	NS	NS	NS										
60-29-7	Diethyl Ether	NS	NS	NS										
108-20-3	Diisopropyl Ether (DIPE)	NS	NS	NS										
100-41-4	Ethylbenzene	1.0	390	1.0										
87-68-3	Hexachlorobutadiene	NS	NS	NS										
74-88-4	Iodomethane	NS	NS	NS										
98-82-8	Isopropylbenzene	NS	NS	NS										
1330-20-7	m,p-Xylene	0.26	0	0.26										
79-20-9	Methyl acetate	NS	NS	NS		U		U		U		U		U
1634-04-4	Methyl tert-butyl ether	0.93	500	0.93										
108-87-2	Methylcyclohexane	NS	NS	NS										
75-09-2	Methylene chloride	0.05	500	0.05	0.0028			U		U		U		U
104-51-8	n-Butylbenzene	12	12	12										
103-65-1	n-Propylbenzene	3.9	4	3.9										
91-20-3	Naphthalene	12	12	12										
95-47-6	o-Xylene	NS	0	NS										
99-87-6	p-Isopropyltoluene (p-Cymene)	NS	NS	NS										
135-98-8	sec-Butylbenzene	11	11	11										
100-42-5	Styrene	NS	NS	NS										
994-05-8	tert-Amyl Methyl Ether (TAME)	NS	NS	NS										
75-65-0	tert-Butyl Alcohol (TBA)	NS	NS	NS										
637-92-3	tert-Butyl Ethyl Ether (TBEE)	NS	NS	NS										
98-06-6	tert-Butylbenzene	5.9	6	5.9										
127-18-4	Tetrachloroethene	1.3	150	1.3		U		U		U		U		U
109-99-9	Tetrahydrofuran	NS	NS	NS										
108-88-3	Toluene	0.7	500	0.7										
156-60-5	trans-1,2-Dichloroethene	0.19	500	0.19										
10061-02-6	trans-1,3-Dichloropropene	NS	NS	NS										
110-57-6	trans-1,4-Dichloro-2-butene	NS	NS	NS										
79-01-6	Trichloroethene	0.47	200	0.47		U		U		U		U		U
75-69-4	Trichlorofluoromethane	NS	NS	NS										
108-05-4	Vinyl acetate	NS	NS	NS										
75-01-4	Vinyl chloride	0.02	13	0.02										
1330-20-7	Xylene (Total)	1.6	500	1.6										
Total VOC					0.0107		60		1,289		0.0257		0.01	
Total CVOC					0.0028		60		1,289		0.0188		0.002	

Sample ID		TW-1I		TW-2D		TW-2D		TW-3D		TW-3D DUP-110512		TW-3D		TW-4I	
Date		11/12/2012		11/1/2012		11/1/2012		11/5/2012		11/5/2012		11/5/2012		11/15/2012	
Depth		17-18		16-17		24-25		17-18		17-18		29-30		7-9	
Area		Area B		Area C		Area C		Area A		Area A		Area A		Area A	
CAS No.	VOC (mg/Kg) (1)														
630-20-6	1,1,1,2-Tetrachloroethane														
71-55-6	1,1,1-Trichloroethane	480	D	0.024		22	D	0.48	U	0.0066	U	0.0039	U	0.068	U
79-34-5	1,1,2,2-Tetrachloroethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
79-00-5	1,1,2-Trichloroethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
75-34-3	1,1-Dichloroethane	320	D	38	D	53	D	93	D	42	D	0.0039	U	8.4	D
75-35-4	1,1-Dichloroethene	100	D	0.014		1.2	E	0.48	U	0.0052	U	0.0039	U	0.068	U
563-58-6	1,1-Dichloropropene														
87-61-6	1,2,3-Trichlorobenzene														
96-18-4	1,2,3-Trichloropropane														
120-82-1	1,2,4-Trichlorobenzene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
95-63-6	1,2,4-Trimethylbenzene					0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
96-12-8	1,2-Dibromo-3-chloropropane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
106-93-4	1,2-Dibromoethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
95-50-1	1,2-Dichlorobenzene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
107-06-2	1,2-Dichloroethane	70	D	0.049		1.5	DJ	9.5		10	D	0.0039	U	3.8	
78-87-5	1,2-Dichloropropane	0.044	J	0.0051	U	0.0047	J	0.48	U	0.0052	U	0.0039	U	0.068	U
108-67-8	1,3,5-Trimethylbenzene														
541-73-1	1,3-Dichlorobenzene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
142-28-9	1,3-Dichloropropane														
106-46-7	1,4-Dichlorobenzene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
123-91-1	1,4-Dioxane														
594-20-7	2,2-Dichloropropane														
78-93-3	2-Butanone (Methyl ethyl ketone)	0.89	J	0.025	U	0.066		2.4	U	0.6		0.019	U	0.310	J
95-49-8	2-Chlorotoluene														
591-78-6	2-Hexanone (Methyl butyl ketone)	1.4	U	0.025	U	0.034	U	2.4	U	0.026	U	0.019	U	0.340	U
106-43-4	4-Chlorotoluene														
99-87-6	4-Isopropyltoluene														
108-10-1	4-Methyl-2-pentanone	0.099	J	0.025	U	0.0046	J	2.4	U	0.027	J	0.019	U	0.056	J
67-64-1	Acetone	3.70		0.012	J	0.2		2.4	U	0.57		0.019	U	0.340	U
107-13-1	Acrylonitrile														
71-43-2	Benzene	0.049	J	0.0051	U	0.001	J	0.48	U	0.0052	U	0.0039	U	0.033	J
108-86-1	Bromobenzene														
74-97-5	Bromochloromethane														
75-27-4	Bromodichloromethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
75-25-2	Bromoform	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
74-83-9	Bromomethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
75-15-0	Carbon disulfide	0.270	U	0.0051	U	0.0062	J	0.48	U	0.0052	U	0.0039	U	0.068	U
56-23-5	Carbon tetrachloride	0.270	U	0.0051	U	0.66	E	0.48	U	0.0052	U	0.0039	U	0.068	U
108-90-7	Chlorobenzene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
75-00-3	Chloroethane	0.270	U	0.0079		0.013		0.48	U	0.22		0.0039	U	10	D
67-66-3	Chloroform	2.00		0.0051	U	0.0084		0.48	U	0.0052	U	0.0039	U	0.068	U
74-87-3	Chloromethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
156-59-2	cis-1,2-Dichloroethene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.190	
10061-01-5	cis-1,3-Dichloropropene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
110-82-7	Cyclohexane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.034	J
124-48-1	Dibromochloromethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.039	J
74-95-3	Dibromomethane														
75-71-8	Dichlorodifluoromethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
60-29-7	Diethyl Ether														
108-20-3	Diisopropyl Ether (DIPE)														
100-41-4	Ethylbenzene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
87-68-3	Hexachlorobutadiene														
74-88-4	Iodomethane														
98-82-8	Isopropylbenzene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
1330-20-7	m,p-Xylene														
79-20-9	Methyl acetate	0.640		0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
1634-04-4	Methyl tert-butyl ether	0.270	U	0.0051	U	0.0013	J	0.48	U	0.0052	U	0.0039	U	0.068	U
108-87-2	Methylcyclohexane	0.270	U	0.013		0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
75-09-2	Methylene chloride	0.078	J	0.8	J	0.012		0.38	JB	0.15		0.0039	U	0.13	
104-51-8	n-Butylbenzene														
103-65-1	n-Propylbenzene														
91-20-3	Naphthalene														
95-47-6	o-Xylene														
99-87-6	p-Isopropyltoluene (p-Cymene)														
135-98-8	sec-Butylbenzene														
100-42-5	Styrene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
994-05-8	tert-Amyl Methyl Ether (TAME)														
75-65-0	tert-Butyl Alcohol (TBA)														
637-92-3	tert-Butyl Ethyl Ether (TBEE)														
98-06-6	tert-Butylbenzene														
127-18-4	Tetrachloroethene	0.270	U	0.00089	J	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.180	
109-99-9	Tetrahydrofuran														
108-88-3	Toluene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.071	
156-60-5	trans-1,2-Dichloroethene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
10061-02-6	trans-1,3-Dichloropropene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
110-57-6	trans-1,4-Dichloro-2-butene														
79-01-6	Trichloroethene	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.60	
75-69-4	Trichlorofluoromethane	0.270	U	0.0051	U	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
108-05-4	Vinyl acetate														
75-01-4	Vinyl chloride	4.2		0.0061		0.017		0.48	U	0.063		0.0039	U	0.36	
1330-20-7	Xylene (Total)	0.540	U	0.0017	J	0.0067	U	0.48	U	0.0052	U	0.0039	U	0.068	U
Total VOC		981.7		38.919		78.7142		102.88		53.64		ND		24.203	
Total CVOC		974.4		38.891		78.4067		102.88		52.43		ND		24.203	

Sample ID		TW-5S		TW-6D		TW-7D		DC-ISB-01		DC-ISB-01		DC-ISB-01		DC-ISB-02	
Date		11/9/2012		11/27/2012		11/19/2012		12/20/2016		12/21/2016		12/21/2016		12/29/2016	
Depth		16-18		17-18		17-18		14-15		16-17		62-63		6-7	
Area		Area B		Area B		Area B		Area B		Area B		Area B		Area B	
CAS No.	VOC (mg/Kg) (1)														
630-20-6	1,1,1,2-Tetrachloroethane													0.0094	U
71-55-6	1,1,1-Trichloroethane	1.6	D	0.015		42	H	0.08		0.00096	U	0.0012	U	9.2	
79-34-5	1,1,2,2-Tetrachloroethane	0.004	U	0.0046	U	0.0048	U	0.0013	U	0.00086	U	0.0011	U	0.013	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.004	U	0.0046	U	0.0048	U	0.0013	U	0.00086	U	0.0011	U	0.015	U
79-00-5	1,1,2-Trichloroethane	0.004	U	0.0046	U	0.0048	U	0.0017	U	0.0012	U	0.0014	U	0.019	U
75-34-3	1,1-Dichloroethane	2.1	D	85.0	D	4.5	H	17		0.093		0.014		1.5	
75-35-4	1,1-Dichloroethene	0.065		0.09		0.68	DJH	2.6		0.056		0.0013	U	1.1	
563-58-6	1,1-Dichloropropene													0.01	U
87-61-6	1,2,3-Trichlorobenzene							0.00086	U	0.00058	U	0.00071	U	0.011	U
96-18-4	1,2,3-Trichloropropane													0.017	U
120-82-1	1,2,4-Trichlorobenzene	0.004	U	0.0046	U	0.0048	U	0.0011	U	0.00077	U	0.00094	U	0.015	U
95-63-6	1,2,4-Trimethylbenzene			0.0046	U	0.0048	U							0.014	U
96-12-8	1,2-Dibromo-3-chloropropane			0.0046	U	0.0048	U	0.0016	U	0.0011	U	0.0013	U	0.029	U
106-93-4	1,2-Dibromoethane	0.004	U	0.0046	U	0.0048	U	0.0014	U	0.00096	U	0.0012	U	0.012	U
95-50-1	1,2-Dichlorobenzene	0.004	U	0.0046	U	0.0048	U	0.001	U	0.00067	U	0.00082	U	0.013	U
107-06-2	1,2-Dichloroethane	0.61	D	4.6	D	0.034		1.7		0.029		0.0015	U	0.015	U
78-87-5	1,2-Dichloropropane	0.004	U	0.0025	J	0.0048	U	0.0019	U	0.0012	U	0.0015	U	0.01	U
108-67-8	1,3,5-Trimethylbenzene													0.01	U
541-73-1	1,3-Dichlorobenzene	0.004	U	0.0046	U	0.0048	U	0.001	U	0.00067	U	0.00082	U	0.013	U
142-28-9	1,3-Dichloropropane													0.01	U
106-46-7	1,4-Dichlorobenzene	0.004	U	0.0046	U	0.0048	U	0.0011	U	0.00077	U	0.00094	U	0.012	U
123-91-1	1,4-Dioxane							0.082	U	0.055	U	0.068	U	2.1	U
594-20-7	2,2-Dichloropropane													0.017	U
78-93-3	2-Butanone (Methyl ethyl ketone)	0.0072	J	0.098		0.024	U	0.088		0.075		0.021	U	0.19	U
95-49-8	2-Chlorotoluene													0.0095	U
591-78-6	2-Hexanone (Methyl butyl ketone)	0.02	U	0.023	U	0.024	U	0.016	U	0.01	U	0.013	U	0.12	U
106-43-4	4-Chlorotoluene													0.011	U
99-87-6	4-Isopropyltoluene													0.012	U
108-10-1	4-Methyl-2-pentanone	0.02	U	0.0061	J	0.024	U	0.011	U	0.0073	U	0.009	U	0.12	U
67-64-1	Acetone	0.026		0.2		0.0079	J	1.4		1.5		0.028	U	0.39	U
107-13-1	Acrylonitrile													0.046	U
71-43-2	Benzene	0.00096	J	0.0046	U	0.0048	U	0.001	U	0.00067	U	0.00082	U	0.0095	U
108-86-1	Bromobenzene													0.012	U
74-97-5	Bromochloromethane							0.002	U	0.0013	U	0.0016	U	0.018	U
75-27-4	Bromodichloromethane	0.004	U	0.0046	U	0.0048	U	0.00086	U	0.00058	U	0.00071	U	0.023	U
75-25-2	Bromoform	0.004	U	0.0046	U	0.0048	U	0.002	U	0.0013	U	0.0016	U	0.017	U
74-83-9	Bromomethane	0.004	U	0.0046	U	0.0048	U	0.006	U	0.004	U	0.0049	U	0.074	U
75-15-0	Carbon disulfide	0.004	U	0.0046	U	0.0048	U	0.0062	U	0.0041	U	0.0051	U	0.081	U
56-23-5	Carbon tetrachloride	0.004	U	0.0046	U	0.0048	U	0.0011	U	0.00077	U	0.00094	U	0.02	U
108-90-7	Chlorobenzene	0.004	U	0.0046	U	0.0048	U	0.001	U	0.00067	U	0.00082	U	0.013	U
75-00-3	Chloroethane	0.004	U	0.014		0.0048	U	0.0021	U	0.0014	U	0.0018	U	0.022	U
67-66-3	Chloroform	0.0017	J	0.0014	J	0.0048	U	0.001	U	0.00067	U	0.00082	U	0.017	U
74-87-3	Chloromethane	0.004	U	0.0046	U	0.0048	U	0.0092	U	0.0061	U	0.0075	U	0.044	U
156-59-2	cis-1,2-Dichloroethene	0.004	U	0.0046	U	0.0048	U	0.0011	U	0.00077	U	0.00094	U	0.012	U
10061-01-5	cis-1,3-Dichloropropene	0.004	U	0.0046	U	0.0048	U	0.001	U	0.00067	U	0.00082	U	0.0095	U
110-82-7	Cyclohexane	0.004	U	0.0046	U	0.0048	U	0.0011	U	0.00077	U	0.00094	U		
124-48-1	Dibromochloromethane	0.004	U	0.0046	U	0.0048	U	0.001	U	0.00067	U	0.00082	U	0.0082	U
74-95-3	Dibromomethane													0.013	U
75-71-8	Dichlorodifluoromethane	0.004	U	0.0046	U	0.0048	U	0.0019	U	0.0012	U	0.0015	U	0.022	U
60-29-7	Diethyl Ether													0.018	U
108-20-3	Diisopropyl Ether (DIPE)													0.014	U
100-41-4	Ethylbenzene	0.00032	J	0.0046	U	0.00047	J	0.0011	U	0.00077	U	0.00094	U	0.01	U
87-68-3	Hexachlorobutadiene													0.047	U
74-88-4	Iodomethane														
98-82-8	Isopropylbenzene	0.004	U	0.0046	U	0.0048	U	0.001	U	0.00067	U	0.00082	U	0.0095	U
1330-20-7	m,p-Xylene														
79-20-9	Methyl acetate	0.004	U	0.0046	U	0.0048	U	0.0023	U	0.0015	U	0.0019	U	0.033	U
1634-04-4	Methyl tert-butyl ether	0.004	U	0.0046	U	0.0028	J	0.0013	U	0.00086	U	0.0011	U	0.0071	U
108-87-2	Methylcyclohexane	0.004	U	0.0046	U	0.0048	U	0.0014	U	0.00096	U	0.0012	U	0.05	U
75-09-2	Methylene chloride	0.004	U	0.084		0.019		0.01	U	0.0068	U	0.0084	U	0.25	U
104-51-8	n-Butylbenzene													0.012	U
103-65-1	n-Propylbenzene													0.01	U
91-20-3	Naphthalene													0.0096	U
95-47-6	o-Xylene							0.001	U	0.00067	U	0.00082	U	0.01	U
99-87-6	p-Isopropyltoluene (p-Cymene)													0.012	U
135-98-8	sec-Butylbenzene													0.01	U
100-42-5	Styrene	0.004	U	0.0046	U	0.0048	U	0.00086	U	0.00058	U	0.00071	U	0.012	U
994-05-8	tert-Amyl Methyl Ether (TAME)													0.0084	U
75-65-0	tert-Butyl Alcohol (TBA)													0.17	U
637-92-3	tert-Butyl Ethyl Ether (TBEE)													0.0075	U
98-06-6	tert-Butylbenzene													0.0096	U
127-18-4	Tetrachloroethene	0.00065	J	0.0046	U	0.003	J	0.0019	U	0.0012	U	0.0015	U	0.022	U
109-99-9	Tetrahydrofuran							0.0032	U	0.0021	U	0.0026	U	0.085	U
108-88-3	Toluene	0.0012	J	0.0046	U	0.0041	J	0.0011	U	0.00077	U	0.00094	U	0.013	U
156-60-5	trans-1,2-Dichloroethene	0.004	U	0.0046	U	0.0048	U	0.0013	U	0.00086	U	0.0011	U	0.012	U
10061-02-6	trans-1,3-Dichloropropene	0.004	U	0.0046	U	0.0048	U	0.001	U	0.00067	U	0.00082	U	0.0089	U
110-57-6	trans-1,4-Dichloro-2-butene													0.025	U
79-01-6	Trichloroethene	0.039		0.0046	U	0.11								0.016	U
75-69-4	Trichlorofluoromethane	0.004	U	0.0046	U	0.0048	U							0.012	U
108-05-4	Vinyl acetate														
75-01-4	Vinyl chloride	0.0057		0.038		0.0036	J	0.062		0.1		0.0013	U	0.011	U
1330-20-7	Xylene (Total)	0.0008	J	0.0046	U	0.0038	J								
Total VOC		4.459		90.179		47.37		47.3464		1.778		0.014		11.8	
Total CVOC		4.420		89.844		47.35		45.9464		0.278		0.014		11.8	

Notes:
See last page, page 8 for Notes.

Table 2-3
Soil Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	DC-ISB-02	DC-ISB-02	DC-ISB-03	DC-ISB-03	DC-ISB-03	DC-ISB-04	DC-ISB-04	DC-ISB-04	DC-ISB-05	DC-ISB-05	DC-ISB-05	DC-ISB-06	DC-ISB-06	DC-ISB-06	DC-ISB-07	DC-ISB-07	DC-ISB-07	DC-ISB-08	DC-ISB-08
Date					12/29/2016	12/29/2016	12/23/2016	12/23/2016	12/23/2016	12/30/2016	12/30/2016	1/3/2017	12/28/2016	12/28/2016	12/29/2016	1/4/2017	1/4/2017	1/4/2017	12/20/2016	12/20/2016	12/20/2016	12/19/2016	12/19/2016
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	18-19	37-37.5	7-8	19-20	48-49	13-14	15-16	65-66.2	6-7	18-19	50-51	18-19	21-22	57-58	7-8	16-17	39.5-40.5	17-18	21-22
Area					Area B	Area B	Area C	Area C	Area C	Area C	Area C	Area C	Area A	Area A	Area B	Area B	Area B	Area B	Area A	Area A	Area A	Area A	Area A
CAS No.	VOC (mg/Kg) (1)			mg/kg																			
630-20-6	1,1,1,2-Tetrachloroethane	NS	NS	NS	0.007 U						0.0087 U												
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	0.0077 U	0.00082 U	**0.33**	**0.0049**	0.0012 U	0.0011 U	0.0096 U	0.00081 U	**2.5**	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.00082 U	0.0011 U	0.00099 U	0.00082 U	0.00097 U	0.0012 U
79-34-5	1,1,2,2-Tetrachloroethane	NS	NS	NS	0.0094 U	0.00074 U	0.00081 U	0.00091 U	0.0011 U	0.00098 U	0.012 U	0.00073 U	0.00092 U	0.001 U	0.001 U	0.00091 U	0.00099 U	0.00073 U	0.00099 U	0.00089 U	0.00074 U	0.00088 U	0.0011 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	NS	0.011 U	0.00074 U	0.00081 U	0.00091 U	0.0011 U	0.00098 U	0.014 U	0.00073 U	0.00092 U	0.001 U	0.001 U	0.00091 U	0.00099 U	0.00073 U	0.00099 U	0.00089 U	0.00074 U	0.00088 U	0.0011 U
79-00-5	1,1,2-Trichloroethane	NS	NS	NS	0.014 U	0.00099 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.017 U	0.00097 U	0.0012 U	0.0014 U	0.0014 U	0.0012 U	0.0013 U	0.00098 U	0.0013 U	0.0012 U	0.00098 U	0.0012 U	0.0015 U
75-34-3	1,1-Dichloroethane	0.27	240	0.27	**1.1**	**0.0025**	**0.27**	**2.5**	**0.0031**	**1.3**	**2.7**	**0.0064**	**0.19**	**0.12**	**0.013**	**0.002**	**0.0089**	0.00057 U	**0.12**	0.0007 U	**0.011**	**0.016**	**0.14**
75-35-4	1,1-Dichloroethene	0.33	500	0.33	**5.2**	0.0009 U	**0.84**	**2.5**	0.0013 U	**0.66**	**1.7**	0.00089 U	**0.1**	**0.024**	**0.015**	0.0011 U	**0.0048**	0.0009 U	**0.13**	0.0011 U	0.0009 U	0.0011 U	0.0014 U
563-58-6	1,1-Dichloropropene	NS	NS	NS	0.0075 U						0.0094 U												
87-61-6	1,2,3-Trichlorobenzene	NS	NS	NS	0.0082 U	0.00049 U	0.00054 U	0.00061 U	0.00072 U	0.00065 U	0.01 U	0.00048 U	0.00061 U	0.00069 U	0.00068 U	0.00061 U	0.00066 U	0.00049 U	0.00066 U	0.0006 U	0.00049 U	0.00058 U	0.00074 U
96-18-4	1,2,3-Trichloropropane	NS	NS	NS	0.013 U						0.016 U												
120-82-1	1,2,4-Trichlorobenzene	NS	NS	NS	0.011 U	0.00066 U	0.00072 U	0.00081 U	0.00097 U	0.0022 U	0.014 U	0.00064 U	0.00081 U	0.00092 U	0.0009 U	0.00081 U	0.00088 U	0.00065 U	0.00088 U	0.0008 U	0.00066 U	0.00078 U	0.00099 U
95-63-6	1,2,4-Trimethylbenzene	3.6	4	3.6	**0.14**						0.013 U												
96-12-8	1,2-Dibromo-3-chloropropane	NS	NS	NS	0.022 U	0.0009 U	0.00099 U	0.0011 U	0.0013 U	0.0012 U	0.027 U	0.00089 U	0.0011 U	0.0013 U	0.0012 U	0.0011 U	0.0012 U	0.0009 U	0.0012 U	0.0011 U	0.0009 U	0.0011 U	0.0014 U
106-93-4	1,2-Dibromoethane	NS	NS	NS	0.0087 U	0.00082 U	0.0009 U	0.001 U	0.0012 U	0.0011 U	0.011 U	0.00081 U	0.001 U	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.00082 U	0.0011 U	0.00099 U	0.00082 U	0.00097 U	0.0012 U
95-50-1	1,2-Dichlorobenzene	1.1	500	1.1	0.01 U	0.00058 U	0.00063 U	0.00071 U	0.00084 U	0.00076 U	0.012 U	0.00056 U	**0.0022**	0.0008 U	0.00079 U	0.00071 U	0.00077 U	0.00057 U	**0.0035**	0.0007 U	0.00057 U	0.00068 U	0.00087 U
107-06-2	1,2-Dichloroethane	0.02	30	0.02	**0.37**	0.0011 U	**0.015**	**1.6**	0.0016 U	**0.048**	**0.082**	0.001 U	**0.01**	**0.073**	**0.057**	0.0013 U	0.0014 U	0.0011 U	**0.018**	0.0013 U	0.0019	**0.0047**	0.0016 U
78-87-5	1,2-Dichloropropane	NS	NS	NS	0.0076 U	0.0011 U	0.0012 U	0.0026	0.0016 U	0.0014 U	0.0096 U	0.001 U	0.0013 U	0.0015 U	0.0015 U	0.0013 U	0.0014 U	0.0011 U	0.0014 U	0.0013 U	0.0011 U	0.0013 U	0.0016 U
108-67-8	1,3,5-Trimethylbenzene	8.4	8	8.4	**0.079**						0.0096 U												
541-73-1	1,3-Dichlorobenzene	2.4	280	2.4	0.01 U	0.00058 U	0.00063 U	0.00071 U	0.00084 U	0.00076 U	0.012 U	0.00056 U	0.00071 U	0.0008 U	0.00079 U	0.00071 U	0.00077 U	0.00057 U	0.00077 U	0.0007 U	0.00057 U	0.00068 U	0.00087 U
142-28-9	1,3-Dichloropropane	NS	NS	NS	0.0076 U						0.0096 U												
106-46-7	1,4-Dichlorobenzene	1.8	130	1.8	0.0088 U	0.00066 U	0.00072 U	0.00081 U	0.00097 U	0.00087 U	0.011 U	0.00064 U	0.00081 U	0.00092 U	0.0009 U	0.00081 U	0.00088 U	0.00065 U	0.00088 U	0.0008 U	0.00066 U	0.00078 U	0.00099 U
123-91-1	1,4-Dioxane	0.1	130	0.1	1.6 U	0.047 U	0.052 U	0.058 U	0.07 U	0.063 U	1.9 U	0.046 U	0.059 U	0.066 U	0.065 U	0.058 U	0.063 U	0.047 U	0.063 U	0.057 U	0.047 U	0.056 U	0.071 U
594-20-7	2,2-Dichloropropane	NS	NS	NS	0.012 U						0.016 U												
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	0.14 U	0.014 U	0.016 U	**0.21**	0.021 U	0.019 U	0.17 U	0.014 U	0.018 U	**0.073**	0.02 U	**0.099**	0.019 U	0.014 U	0.019 U	0.017 U	0.014 U	**0.18**	0.022 U
95-49-8	2-Chlorotoluene	NS	NS	NS	0.007 U						0.0088 U												
591-78-6	2-Hexanone (Methyl butyl ketone)	NS	NS	NS	0.089 U	0.009 U	0.0098 U	0.011 U	0.013 U	0.012 U	0.11 U	0.0088 U	**0.077**	0.012 U	0.012 U	0.011 U	0.012 U	0.0089 U	0.012 U	0.011 U	0.0089 U	0.011 U	0.013 U
106-43-4	4-Chlorotoluene	NS	NS	NS	0.0082 U						0.01 U												
99-87-6	4-Isopropyltoluene	NS	NS	NS	0.0088 U						0.011 U												
108-10-1	4-Methyl-2-pentanone	NS	NS	NS	0.086 U	0.0062 U	0.0068 U	0.0077 U	0.0092 U	0.0083 U	0.11 U	0.0061 U	0.0077 U	0.0087 U	0.0086 U	0.0077 U	0.0083 U	0.0062 U	0.0083 U	0.0076 U	0.0062 U	0.0074 U	0.0094 U
67-64-1	Acetone	0.05	500	0.05	**7.5**	0.019 U	**0.097**	**7.9**	0.028 U	0.026 U	0.36 U	0.019 U	0.024 U	**0.23**	0.026 U	**1.6**	0.026 U	0.019 U	0.026 U	**0.11**	0.019 U	**0.27**	0.029 U
107-13-1	Acrylonitrile	NS	NS	NS	0.034 U						0.043 U												
71-43-2	Benzene	0.06	44	0.06	0.007 U	0.00058 U	0.00063 U	**0.011**	0.00084 U	0.00076 U	0.0088 U	0.00056 U	0.00071 U	0.0008 U	**0.0081**	0.00071 U	0.00077 U	0.00057 U	0.00077 U	0.0007 U	0.00057 U	0.00068 U	0.00087 U
108-86-1	Bromobenzene	NS	NS	NS	0.0088 U	0.012 U			0.011 U		0.011 U												
74-97-5	Bromochloromethane	NS	NS	NS	0.013 U	0.0012 U	0.0013 U	0.0014 U	0.0017 U	0.0015 U	0.016 U	0.0011 U	0.0014 U	0.0016 U	0.0016 U	0.0014 U	0.0015 U	0.0011 U	0.0015 U	0.0014 U	0.0011 U	0.0014 U	0.0017 U
75-27-4	Bromodichloromethane	NS	NS	NS	0.017 U	0.00049 U	0.00054 U	0.00061 U	0.00072 U	0.00065 U	0.022 U	0.00048 U	0.00061 U	0.00069 U	0.00068 U	0.00061 U	0.00066 U	0.00049 U	0.00066 U	0.0006 U	0.00049 U	0.00058 U	0.00074 U
75-25-2	Bromoform	NS	NS	NS	0.012 U	0.0012 U	0.0013 U	0.0014 U	0.0017 U	0.0015 U	0.015 U	0.0011 U	0.0014 U	0.0016 U	0.0016 U	0.0014 U	0.0015 U	0.0011 U	0.0015 U	0.0014 U	0.0011 U	0.0014 U	0.0017 U
74-83-9	Bromomethane	NS	NS	NS	0.055 U	0.0035 U	0.0038 U	0.0043 U	0.0051 U	0.0046 U	0.069 U	0.0034 U	0.0043 U	0.0048 U	0.0047 U	0.0042 U	0.0046 U	0.0034 U	0.0046 U	0.0042 U	0.0034 U	0.0041 U	0.0052 U
75-15-0	Carbon disulfide	NS	NS	NS	0.06 U	0.0035 U	0.0039 U	0.0044 U	0.0052 U	0.0047 U	0.075 U	0.0035 U	0.0044 U	0.0049 U	0.0049 U	0.0044 U	0.0047 U	0.0035 U	0.0047 U	0.0043 U	0.0035 U	0.0042 U	0.0053 U
56-23-5	Carbon tetrachloride	0.76	22	0.76	0.014 U	0.00066 U	0.00072 U	0.00081 U	0.00097 U	0.00087 U	0.018 U	0.00064 U	0.00081 U	0.00092 U	0.0009 U	0.00081 U	0.00088 U	0.00065 U	0.00088 U	0.0008 U	0.00066 U	0.00078 U	0.00099 U
108-90-7	Chlorobenzene	1.1	500	1.1	0.0094 U	0.00058 U	0.00063 U	0.00071 U	0.00084 U	0.00076 U	0.012 U	0.00056 U	0.00071 U	0.0008 U	0.00079 U	0.00071 U	0.00077 U	0.00057 U	0.00077 U	0.0007 U	0.00057 U	0.00068 U	0.00087 U
75-00-3	Chloroethane	NA	NS	NA	0.016 U	0.0012 U	0.0014 U	0.0015 U	0.0018 U	0.0016 U	0.021 U	0.0012 U	0.0015 U	0.0017 U	**0.031**	0.0015 U	0.0016 U	0.0012 U	0.0016 U	0.0015 U	0.0012 U	0.0015 U	0.0019 U
67-66-3	Chloroform	0.37	350	0.37	0.013 U	0.00058 U	0.00063 U	**0.021**	0.00084 U	0.00076 U	0.016 U	0.00056 U	0.00071 U	0.0008 U	0.00079 U	0.00071 U	0.00077 U	0.00057 U	0.00077 U	0.0007 U	0.00057 U	0.00068 U	0.00087 U
74-87-3	Chloromethane	NS	NS	NS	0.032 U	0.0053 U	0.0058 U	0.0065 U	0.0077 U	0.007 U	0.041 U	0.0052 U	0.0065 U	0.0073 U	0.0072 U	0.0065 U	0.007 U	0.0052 U	0.007 U	0.0064 U	0.0053 U	0.0062 U	0.0079 U
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25	0.0086 U	0.00066 U	0.00072 U	**0.014**	0.00097 U	0.00087 U	0.011 U	0.00064 U	**0.0021**	0.00092 U	**0.11**	0.00081 U	0.00088 U	0.00065 U	**0.003**	0.0008 U	**0.0088**	0.00078 U	0.00099 U
10061-01-5	cis-1,3-Dichloropropene	NS	NS	NS	0.007 U	0.00058 U	0.00063 U	0.00071 U	0.00084 U	0.00076 U	0.0088 U	0.00056 U	0.00071 U	0.0008 U	0.00079 U	0.00071 U	0.00077 U	0.00057 U	0.00077 U	0.0007 U	0.00057 U	0.00068 U	0.00087 U
110-82-7	Cyclohexane	NS	NS	NS		0.00066 U	0.00072 U	0.00081 U	0.00097 U	0.00087 U		0.00064 U	0.00081 U	0.00092 U	0.0009 U	0.00081 U	0.00088 U	0.00065 U	0.00088 U	0.0008 U	0.00066 U	0.00078 U	0.00099 U
124-48-1	Dibromochloromethane	NS	NS	NS	0.0061 U	0.00058 U	0.00063 U	0.00071 U	0.00084 U	0.00076 U	0.0076 U	0.00056 U	0.00071 U	0.0008 U	0.00079 U	0.00071 U	0.00077 U	0.00057 U	0.00077 U	0.0007 U	0.00057 U	0.00068 U	0.00087 U
74-95-3	Dibromomethane	NS	NS	NS	0.0094 U						0.012 U												
75-71-8	Dichlorodifluoromethane	NS	NS	NS	0.017 U	0.0011 U	0.0012 U	0.0013 U	0.0016 U	0.0014 U	0.021 U	0.001 U	0.0013 U	0.0015 U	0.0015 U	0.0013 U	0.0014 U	0.0011 U	0.0014 U	0.0013 U	0.0011 U	0.0013 U	0.0016 U
60-29-7	Diethyl Ether	NS	NS	NS	0.013 U						0.016 U												
108-20-3	Diisopropyl Ether (DIPE)	NS	NS	NS	0.011 U						0.013 U												
100-41-4	Ethylbenzene	1.0	390	1.0	0.0076 U	0.00066 U	0.00072 U	0.00081 U	0.00097 U	0.00087 U	0.0096 U	0.00064 U	0.00081 U	0.00092 U	0.0009 U	0.00081 U	0.00088 U	0.00065 U	0.00088 U	0.0008 U	0.00066 U	0.00078 U	0.00099 U
87-68-3	Hexachlorobutadiene	NS	NS	NS	0.034 U						0.043 U												
74-88-4	Iodomethane	NS	NS	NS																			
98-82-8	Isopropylbenzene	NS	NS	NS	0.007 U	0.00058 U	0.00063 U	0.00071 U	0.00084 U	0.00076 U	0.0088 U	0.00056 U	0.00071 U	0.0008 U	0.00079 U	0.00071 U	0.00077 U	0.00057 U	0.00077 U	0.0007 U	0.00057 U	0.00068 U	0.00087 U
1330-20-7	m,p-Xylene	0.26	0	0.26						0.0044 U													
79-20-9	Methyl acetate	NS	NS	NS	0.025 U	0.0013 U	0.0014 U	0.0016 U	0.0019 U	0.0017 U	0.031 U	0.0013 U	0.0016 U	0.0018 U	0.0018 U	0.0016 U	0.0018 U	0.0013 U	0.0018 U	0.0016 U	0.0013 U	0.0016 U	0.002 U
1634-04-4	Methyl tert-butyl ether	0.93	500	0.93	0.0053 U	0.00074 U	0.00081 U	**0.0046**	0.0011 U	0.00098 U	0.0066 U	0.00073 U	0.00092 U	0.001 U	0.001 U	0.00091 U	0.00099 U	0.00073 U	0.00099 U	0.00089 U	0.00074 U	0.00088 U	0.0011 U
108-87-2	Methylcyclohexane	NS	NS	NS	0.037 U	0.00082 U	0.0009 U	0.001 U	0.0012 U	0.0011 U	0.046 U	0.00081 U	**0.008**	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.00082 U	0.0011 U	0.00099 U	0.00082 U	0.00097 U	0.0012 U
75-09-2	Methylene chloride	0.05	500	0.05	0.19 U	0.0058 U	0.0064 U	**0.028**	0.0086 U	0.0077 U	0.23 U	0.0057 U	0.0072 U	0.0081 U	0.008 U	0.0072 U	0.0078 U	0.0058 U	0.0078 U	0.0071 U	0.0058 U	0.0069 U	0.0088 U
104-51-8	n-Butylbenzene	12	12	12	0.0088 U	0.012 U			0.011 U		0.011 U												
103-65-1	n-Propylbenzene	3.9	4	3.9	0.0076 U	0.01 U			0.0096 U		0.0096 U												
91-20-3	Naphthalene	12	12	12	0.0071 U						0.0089 U												
95-47-6	o-Xylene	NS	0	NS	0.0077 U	0.00058 U	0.00063 U	**0.0062**	0.00084 U	0.00076 U	0.0096 U	0.00056 U	0.00071 U	0.0008 U	0.00079 U	0.00071 U	0.00077 U	0.00057 U	0.00077 U	0.0007 U	0.00057 U	0.00068 U	0.00087 U
99-87-6	p-Isopropyltoluene (p-Cymene)	NS	NS	NS	0.0088 U						0.011 U												
135-98-8	sec-Butylbenzene	11	11	11	0.0076 U	0.01 U			0.0096 U		0.0096 U												
100-42-5	Styrene	NS	NS	NS	0.0088 U	0.00049 U	0.00054 U	0.00061 U	0.00072 U	0.00065 U	0.011 U	0.00048 U	0.00061 U	0.00069 U	0.00068 U	0.00061 U	0.00066 U	0.00049 U	0.00066 U	0.0006 U	0.00049 U	0.00058 U	0.00074 U
994-05-8	tert-Amyl Methyl Ether (TAME)	NS	NS	NS	0.0062 U						0.0078 U												
75-65-0	tert-Butyl Alcohol (TBA)	NS	NS	NS	0.13 U						0.16 U												
637-92-3	tert-Butyl Ethyl Ether (TBEE)	NS	NS	NS	0.0056 U						0.007 U												
98-06-6	tert-Butylbenzene	5.9	6	5.9	0.0071 U						0.0089 U												
127-18-4	Tetrachloroethene	1.3	150	1.3	0.016 U	0.0011 U	0.0012 U	**0.01**	0.0016 U	0.0014 U	0.02 U	0.001 U	0.0013 U	0.0015 U	0.0015 U	0.0013 U	0.0014 U	0.0011 U	0.0014 U	0.0013 U	0.0011 U	0.0013 U	0.0016 U
109-99-9	Tetrahydrofuran	NS	NS	NS	0.063 U	0.0018 U	0.002 U	0.002 U	0.0027 U	0.011 U	0.079 U	0.0018 U	0.0022 U	0.0025 U	0.0025 U	0.0022 U	0.0024 U	0.0018 U	0.0024 U	0.0022 U	0.0018 U	0.0021 U	0.0027 U
108-88-3	Toluene	0.7	500	0.7	0.01 U	0.00066 U	0.00072 U	**0.021**	0.00097 U	0.00087 U	0.012 U	0.00064 U	0.00081 U	0.00092 U	0.0009 U	0.00081 U	0.00088 U	0.00065 U	0.00088 U	0.0008 U	0.00066 U	0.00078 U	0.00099 U
156-60-5	trans-1,2-Dichloroethene	0.19	500	0.19	0.0088 U	0.00074 U	0.00081 U	0.00091 U	0.0011 U	0.00098 U	0.011 U	0.00073 U	0.00092 U	0.001 U	0.001 U	0.00091 U	0.00099 U	0.00073 U	0.00099 U	0.00089 U	0.00074 U	0.00088 U	0.0011 U
10061-02-6	trans-1,3-Dichloropropene	NS	NS	NS	0.0066 U	0.00058 U	0.00063 U	0.00071 U	0.00084 U	0.00076 U	0.0082 U	0.00056 U	0.00071 U	0.0008 U	0.00079 U	0.00071 U	0.00077 U	0.00057 U	0.00077 U	0.0007 U	0.00057 U	0.00068 U	0.00087 U
110-57-6	trans-1,4-Dichloro-2-butene	NS	NS	NS	0.018 U						0.023 U												
79-01-6	Trichloroethene	0.47	200	0.47	**0.3**						0.015 U												
75-69-4	Trichlorofluoromethane	NS	NS	NS	0.0086 U						0.011 U												
108-05-4	Vinyl acetate	NS	NS	NS																			
75-01-4	Vinyl chloride	0.02	13	0.02	0.0078 U	0.0009 U	0.00099 U	**0.047**	0.0013 U	0.0012 U	0.0098 U	0.00089 U	0.0011 U	**0.096**	**0.078**	0.0011 U	0.0012 U	0.0009 U	0.0012 U	0.0011 U	**0.031**	**0.08**	**0.093**
1330-20-7	Xylene (Total)	1.6	500	1.6																			
Total VOC					**14.249**	**0.0025**	**1.552**	**14.880**	**0.003**	**2.008**	**4.482**	**0.006**	**2.889**	**0.616**	**0.312**	**1.701**	**0.014**	**ND**	**0.275**	**0.110**	**0.053**	**0.551**	**0.233**
Total CVOC					**6.530**	**0.0025**	**1.455**	**6.697**	**0.003**	**2.008**	**4.482**	**0.006**	**2.889**	**0.386**	**0.312**	**0.002**	**0.014**	**ND**	**0.275**	**ND**	**0.053**	**0.101**	**0.233**

Notes:
See last page, page 8 for Notes.

Table 2-3
Soil Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	DC-ISB-08	PR-SB1	PR-SB1	PR-SB2	PR-SB2	PR-SB3	PR-SB3	DUP-1 042617 (PR-SB4)	PR-SB4	PR-SB4	PR-SB4	PR-SB5	PR-SB5	PR-SB6	PR-SB6	PR-SB7	PR-SB7	PR-SB8	PR-SB8
Date					12/20/2016	4/24/2017	4/24/2017	4/25/2017	4/25/2017	4/25/2017	4/25/2017	4/26/2017	4/26/2017	4/26/2017	4/26/2017	4/26/2017	4/27/2017	4/27/2017	4/27/2017	4/27/2017	4/27/2017	4/27/2017	4/27/2017
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	48-49.1	5-6	16-18	6.5-8	13.5-15	8.5-10	18.5-20	13.5-15	13.5-15	17-18.5	26-27.5	7-8.5	18.5-20	8.5-10	12-13.5	2-5	18.5-20	13.5-15	15-17
Area					Area A	Area A	Area A	Area A	Area A		Area A	Area B (south)	Area B (south)	Area B (south)	Area B (south)	Area A	Area A	Area C	Area C	Area C	Area C	Area B (north)	Area B (north)
CAS No.	VOC (mg/Kg) (1)			mg/kg																			
630-20-6	1,1,1,2-Tetrachloroethane	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	0.0015 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	5.7 (Note 4)	0.0068	2.2 (Note 4)	0.0018 U	0.0016 U	0.0018 U
79-34-5	1,1,2,2-Tetrachloroethane	NS	NS	NS	0.0013 U	0.001 U	0.00079 U	0.00073 U	0.001 U	0.0009 U	0.00089 U	0.00097 U	0.001 U	0.00089 U	0.001 U	0.00091 U	0.00088 U	0.0014 U	0.00094 U	0.00096 U	0.00092 U	0.00081 U	0.00091 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	NS	0.0013 U	0.01 U	0.0079 U	0.0073 U	0.01 U	0.009 U	0.0089 U	0.0097 U	0.01 U	0.0089 U	0.01 U	0.0091 U	0.0088 U	0.014 U	0.0094 U	0.0096 U	0.0092 U	0.0081 U	0.0091 U
79-00-5	1,1,2-Trichloroethane	NS	NS	NS	0.0017 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
75-34-3	1,1-Dichloroethane	0.27	240	0.27	0.005	0.017	0.0016 U	13 (Note 4)	0.029	2.1 (Note 4)	0.0018 U	0.023	0.05	0.0018 U	0.015	0.16	0.0018 U	14 (Note 4)	17 (Note 4)	6.3 (Note 4)	0.0018 U	0.0038	0.0098
75-35-4	1,1-Dichloroethene	0.33	500	0.33	0.0016 U	0.0041 U	0.0032 U	0.004	0.028	0.0036 U	0.0036 U	0.018	0.037	0.0036 U	0.014	0.066	0.0035 U	2 (Note 4)	1.7 (Note 4)	7.2 (Note 4)	0.0037 U	0.025	0.02
563-58-6	1,1-Dichloropropene	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
87-61-6	1,2,3-Trichlorobenzene	NS	NS	NS	0.00087 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
96-18-4	1,2,3-Trichloropropane	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
120-82-1	1,2,4-Trichlorobenzene	NS	NS	NS	0.0012 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
95-63-6	1,2,4-Trimethylbenzene	3.6	4	3.6		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
96-12-8	1,2-Dibromo-3-chloropropane	NS	NS	NS	0.0016 U	0.0041 U	0.0032 U	0.0029 U	0.0041 U	0.0036 U	0.0036 U	0.0039 U	0.004 U	0.0036 U	0.0041 U	0.0036 U	0.0035 U	0.0056 U	0.0037 U	0.0039 U	0.0037 U	0.0032 U	0.0036 U
106-93-4	1,2-Dibromoethane	NS	NS	NS	0.0015 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
95-50-1	1,2-Dichlorobenzene	1.1	500	1.1	0.001 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
107-06-2	1,2-Dichloroethane	0.02	30	0.02	0.0083	0.0024	0.0016 U	3.2 (Note 4)	0.0064	0.0018 U	0.0018 U	0.0028 U	0.0082	0.0018 U	0.0021 U	0.015	0.0018 U	4.5	5	0.042	0.0018 U	0.0016 U	0.0018 U
78-87-5	1,2-Dichloropropane	NS	NS	NS	0.0019 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
108-67-8	1,3,5-Trimethylbenzene	8.4	8	8.4		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
541-73-1	1,3-Dichlorobenzene	2.4	280	2.4	0.001 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
142-28-9	1,3-Dichloropropane	NS	NS	NS		0.001 U	0.00079 U	0.00073 U	0.001 U	0.0009 U	0.00089 U	0.00097 U	0.001 U	0.00089 U	0.001 U	0.00091 U	0.00088 U	0.0014 U	0.00094 U	0.00096 U	0.00092 U	0.00081 U	0.00091 U
106-46-7	1,4-Dichlorobenzene	1.8	130	1.8	0.0012 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
123-91-1	1,4-Dioxane	0.1	130	0.1	0.084 U	0.1 U	0.079 U	0.073 U	0.1 U	0.09 U	0.089 U	0.097 U	0.1 U	0.089 U	0.1 U	0.091 U	0.088 U	0.14 U	0.094 U	0.096 U	0.092 U	0.081 U	0.091 U
594-20-7	2,2-Dichloropropane	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	0.025 U	0.041 U	0.032 U	0.029 U	0.063	0.036 U	0.036 U	0.1	0.13	0.036 U	0.042 U	0.036 U	0.035 U	0.056 U	0.037 U	0.039 U	0.037 U	0.035	0.058
95-49-8	2-Chlorotoluene	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
591-78-6	2-Hexanone (Methyl butyl ketone)	NS	NS	NS	0.016 U	0.02 U	0.016 U	0.015 U	0.02 U	0.018 U	0.018 U	0.019 U	0.02 U	0.018 U	0.021 U	0.018 U	0.018 U	0.028 U	0.019 U	0.019 U	0.018 U	0.016 U	0.018 U
106-43-4	4-Chlorotoluene	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
99-87-6	4-Isopropyltoluene	NS	NS	NS																			
108-10-1	4-Methyl-2-pentanone	NS	NS	NS	0.011 U	0.02 U	0.016 U	0.015 U	0.02 U	0.018 U	0.018 U	0.019 U	0.02 U	0.018 U	0.021 U	0.018 U	0.018 U	0.028 U	0.019 U	0.019 U	0.018 U	0.016 U	0.018 U
67-64-1	Acetone	0.05	500	0.05	0.034 U	0.1 U	0.083	0.073 U	0.78	0.09 U	0.089 U	1.7	1.7	0.54	0.57	0.091 U	0.13	0.14 U	0.31	0.2	0.22	0.47	0.77
107-13-1	Acrylonitrile	NS	NS	NS		0.0061 U	0.0047 U	0.0044 U	0.0061 U	0.0054 U	0.0053 U	0.0058 U	0.0061 U	0.0053 U	0.0062 U	0.0054 U	0.0053 U	0.0084 U	0.0056 U	0.0058 U	0.0055 U	0.0048 U	0.0055 U
71-43-2	Benzene	0.06	44	0.06	0.001 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0027	0.0018 U	0.0016 U	0.0018 U
108-86-1	Bromobenzene	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
74-97-5	Bromochloromethane	NS	NS	NS	0.002 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
75-27-4	Bromodichloromethane	NS	NS	NS	0.00087 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
75-25-2	Bromoform	NS	NS	NS	0.002 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
74-83-9	Bromomethane	NS	NS	NS	0.0061 U	0.01 U	0.0079 U	0.0073 U	0.01 U	0.009 U	0.0089 U	0.0097 U	0.01 U	0.0089 U	0.01 U	0.0091 U	0.0088 U	0.014 U	0.0094 U	0.0096 U	0.0092 U	0.0081 U	0.0091 U
75-15-0	Carbon disulfide	NS	NS	NS	0.0063 U	0.0061 U	0.0047 U	0.0044 U	0.0061 U	0.0054 U	0.0053 U	0.0058 U	0.0061 U	0.0053 U	0.0062 U	0.0054 U	0.0053 U	0.0084 U	0.0056 U	0.0058 U	0.0055 U	0.0048 U	0.0055 U
56-23-5	Carbon tetrachloride	0.76	22	0.76	0.0012 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
108-90-7	Chlorobenzene	1.1	500	1.1	0.001 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
75-00-3	Chloroethane	NA	NS	NA	0.044	0.02 U	0.016 U	0.015 U	0.02 U	0.018 U	0.018 U	0.019 U	0.02 U	0.018 U	0.021 U	0.018 U	0.018 U	0.19	0.019 U	0.019 U	0.018 U	0.016 U	0.018 U
67-66-3	Chloroform	0.37	350	0.37	0.001 U	0.0041 U	0.0032 U	0.0029 U	0.0041 U	0.0036 U	0.0036 U	0.0039 U	0.004 U	0.0036 U	0.0041 U	0.0036 U	0.0035 U	0.011	0.0054 U	0.0039 U	0.0037 U	0.0032 U	0.0036 U
74-87-3	Chloromethane	NS	NS	NS	0.0093 U	0.01 U	0.0079 U	0.0073 U	0.01 U	0.009 U	0.0089 U	0.0097 U	0.01 U	0.0089 U	0.01 U	0.0091 U	0.0088 U	0.014 U	0.0094 U	0.0096 U	0.0092 U	0.0081 U	0.0091 U
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25	0.0012 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.0023	0.0018 U	0.0021 U	0.012	0.0018 U	0.0059	0.0019 U	1.9	0.0018 U	0.0016 U	0.0018 U
10061-01-5	cis-1,3-Dichloropropene	NS	NS	NS	0.001 U	0.001 U	0.00079 U	0.00073 U	0.001 U	0.0009 U	0.00089 U	0.00097 U	0.001 U	0.00089 U	0.001 U	0.00091 U	0.00088 U	0.0014 U	0.00094 U	0.00096 U	0.00092 U	0.00081 U	0.00091 U
110-82-7	Cyclohexane	NS	NS	NS	0.0012 U																		
124-48-1	Dibromochloromethane	NS	NS	NS	0.001 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
74-95-3	Dibromomethane	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
75-71-8	Dichlorodifluoromethane	NS	NS	NS	0.0019 U	0.02 U	0.016 U	0.015 U	0.02 U	0.018 U	0.018 U	0.019 U	0.02 U	0.018 U	0.021 U	0.018 U	0.018 U	0.028 U	0.019 U	0.019 U	0.018 U	0.016 U	0.018 U
60-29-7	Diethyl Ether	NS	NS	NS		0.02 U	0.016 U	0.015 U	0.02 U	0.018 U	0.018 U	0.019 U	0.02 U	0.018 U	0.021 U	0.018 U	0.018 U	0.028 U	0.019 U	0.019 U	0.018 U	0.016 U	0.018 U
108-20-3	Diisopropyl Ether (DIPE)	NS	NS	NS		0.001 U	0.00079 U	0.00073 U	0.001 U	0.0009 U	0.00089 U	0.00097 U	0.001 U	0.00089 U	0.001 U	0.00091 U	0.00088 U	0.0014 U	0.00094 U	0.00096 U	0.00092 U	0.00081 U	0.00091 U
100-41-4	Ethylbenzene	1.0	390	1.0	0.0012 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
87-68-3	Hexachlorobutadiene	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
74-88-4	Iodomethane	NS	NS	NS																			
98-82-8	Isopropylbenzene	NS	NS	NS	0.001 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
1330-20-7	m,p-Xylene	0.26	0	0.26		0.0041 U	0.0032 U	0.0029 U	0.0041 U	0.0036 U	0.0036 U	0.0039 U	0.004 U	0.0036 U	0.0041 U	0.0036 U	0.0035 U	0.0056 U	0.0037 U	0.0039 U	0.0037 U	0.0032 U	0.0036 U
79-20-9	Methyl acetate	NS	NS	NS	0.0023 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
1634-04-4	Methyl tert-butyl ether	0.93	500	0.93	0.0013 U	0.0041 U	0.0032 U	0.0029 U	0.0043 U	0.0036 U	0.0036 U	0.0039 U	0.004 U	0.0036 U	0.0041 U	0.0036 U	0.0035 U	0.0056 U	0.0037 U	0.0039 U	0.0037 U	0.0032 U	0.0036 U
108-87-2	Methylcyclohexane	NS	NS	NS	0.0015 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
75-09-2	Methylene chloride	0.05	500	0.05	0.01 U	0.02 U	0.016 U	0.015 U	0.02 U	0.018 U	0.018 U	0.019 U	0.02 U	0.018 U	0.021 U	0.018 U	0.018 U	0.028 U	0.019 U	0.019 U	0.018 U	0.016 U	0.018 U
104-51-8	n-Butylbenzene	12	12	12		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
103-65-1	n-Propylbenzene	3.9	4	3.9		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
91-20-3	Naphthalene	12	12	12		0.0041 U	0.0032 U	0.0029 U	0.0041 U	0.0036 U	0.0036 U	0.0039 U	0.004 U	0.0036 U	0.0041 U	0.0036 U	0.0035 U	0.0056 U	0.0037 U	0.0039 U	0.0037 U	0.0032 U	0.0036 U
95-47-6	o-Xylene	NS	0	NS	0.001 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
99-87-6	p-Isopropyltoluene (p-Cymene)	NS	NS	NS		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
135-98-8	sec-Butylbenzene	11	11	11		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
100-42-5	Styrene	NS	NS	NS	0.00087 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
994-05-8	tert-Amyl Methyl Ether (TAME)	NS	NS	NS		0.001 U	0.00079 U	0.00073 U	0.001 U	0.0009 U	0.00089 U	0.00097 U	0.001 U	0.00089 U	0.001 U	0.00091 U	0.00088 U	0.0014 U	0.00094 U	0.00096 U	0.00092 U	0.00081 U	0.00091 U
75-65-0	tert-Butyl Alcohol (TBA)	NS	NS	NS		0.041 U	0.032 U	0.029 U	0.074	0.036 U	0.036 U	0.039 U	0.04 U	0.036 U	0.041 U	0.036 U	0.035 U	0.056 U	0.037 U	0.039 U	0.037 U	0.032 U	0.036 U
637-92-3	tert-Butyl Ethyl Ether (TBEE)	NS	NS	NS		0.001 U	0.00079 U	0.00073 U	0.001 U	0.0009 U	0.00089 U	0.00097 U	0.001 U	0.00089 U	0.001 U	0.00091 U	0.00088 U	0.0014 U	0.00094 U	0.00096 U	0.00092 U	0.00081 U	0.00091 U
98-06-6	tert-Butylbenzene	5.9	6	5.9		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
127-18-4	Tetrachloroethene	1.3	150	1.3	0.0019 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0023	0.0018 U	0.0028 U	0.0019 U	0.0019 U	0.0018 U	0.0016 U	0.0018 U
109-99-9	Tetrahydrofuran	NS	NS	NS	0.0032 U	0.01 U	0.0079 U	0.0073 U	0.01 U	0.009 U	0.0089 U	0.0097 U	0.01 U	0.0089 U	0.01 U	0.0091 U	0.0088 U	0.014 U	0.0094 U	0.0096 U	0.0092 U	0.0081 U	0.0091 U
108-88-3	Toluene	0.7	500	0.7	0.0012 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0054 U	0.0018 U	0.0016 U	0.0018 U
156-60-5	trans-1,2-Dichloroethene	0.19	500	0.19	0.0013 U	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U	0.0028 U	0.0019 U	0.0021	0.0018 U	0.0016 U	0.0018 U
10061-02-6	trans-1,3-Dichloropropene	NS	NS	NS	0.001 U	0.001 U	0.00079 U	0.00073 U	0.001 U	0.0009 U	0.00089 U	0.00097 U	0.001 U	0.00089 U	0.001 U	0.00091 U	0.00088 U	0.0014 U	0.00094 U	0.00096 U	0.00092 U	0.00081 U	0.00091 U
110-57-6	trans-1,4-Dichloro-2-butene	NS	NS	NS		0.0041 U	0.0032 U	0.0029 U	0.0041 U	0.0036 U	0.0036 U	0.0039 U	0.004 U	0.0036 U	0.0041 U	0.0036 U	0.0035 U	0.0056 U	0.0037 U	0.0039 U	0.0037 U	0.0032 U	0.0036 U
79-01-6	Trichloroethene	0.47	200	0.47		0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.0022	0.0018 U	0.0021 U	0.019	0.0018 U	0.012	0.0056	0.082	0.0018 U	0.0016 U	0.0018 U
75-69-4	Trichlorofluoromethane	NS	NS	NS		0.01 U	0.0079 U	0.0073 U	0.01 U	0.009 U	0.0089 U	0.0097 U	0.01 U	0.0089 U	0.01 U	0.0091 U	0.0088 U	0.014 U	0.0094 U	0.0096 U	0.0092 U	0.0081 U	0.0091 U
108-05-4	Vinyl acetate	NS	NS	NS																			
75-01-4	Vinyl chloride	0.02	13	0.02	0.0016 U	0.01 U	0.0079 U	0.032	0.037	0.066	0.0089 U	0.022	0.025	0.0089 U	0.01 U	0.012	0.0088 U	0.014 U	0.015	0.034	0.0092 U	0.0081 U	0.0091 U
1330-20-7	Xylene (Total)	1.6	500	1.6																			
Total VOC					0.057	0.019	0.083	16.236	1.017	2.166	ND	1.863	1.955	0.540	0.599	0.286	0.130	26.419	24.037	17.963	0.220	0.534	0.858
Total CVOC					0.057	0.019	ND	16.236	0.100	2.166	ND	0.063	0.125	0.00	0.029	0.286	0.00	26.419	23.727	17.760	0.000	0.064	0.030

Notes:
See last page, page 8 for Notes.

Table 2-3
Soil Analytical Data
MHBP Treatment Area, Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	PR-SB9		DUP-2 042817 (PR-SB9)		PR-SB9		PR-SB10		PR-SB10		PR-SB11		PR-SB11		PR-SB12		PR-SB12		PR-SB13		PR-SB13	
Date					4/28/2017		4/28/2017		4/28/2017		4/28/2017		4/28/2017		5/1/2017		5/1/2017		5/1/2017		5/1/2017		5/2/2017		5/2/2017	
Depth					3.5-5		18.5-20		18.5-20		7-8.5		18.5-20		9-11		18.5-20		5-7		15-17		8.5-9		15-17	
Area		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area C		Area B (north) in MHBP building		Area B (north) in MHBP building	
CAS No.	VOC (mg/Kg) (1)			mg/kg																						
630-20-6	1,1,1,2-Tetrachloroethane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	**0.045**		0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
79-34-5	1,1,2,2-Tetrachloroethane	NS	NS	NS	0.00087	U	0.00076	U	0.00079	U	0.00084	U	0.00086	U	0.0011	U	0.00093	U	0.0011	U	0.00097	U	0.0011	U	0.00099	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	NS	0.0087	U	0.0076	U	0.0079	U	0.0084	U	0.0086	U	0.011	U	0.0093	U	0.011	U	0.0097	U	0.011	U	0.0099	U
79-00-5	1,1,2-Trichloroethane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
75-34-3	1,1-Dichloroethane	0.27	240	0.27	**0.12**		**0.0016**		**0.003**		**0.66 (Note 4)**		0.0017	U	**0.0025**		0.0019	U	**0.091**		**0.0067**		0.0023	U	0.002	U
75-35-4	1,1-Dichloroethene	0.33	500	0.33	**2.4 (Note 4)**		0.0031	U	0.0032	U	**0.13**		0.0034	U	0.0043	U	0.0037	U	**0.065**		**0.0098**		0.0045	U	0.004	U
563-58-6	1,1-Dichloropropene	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
87-61-6	1,2,3-Trichlorobenzene	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
96-18-4	1,2,3-Trichloropropane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
120-82-1	1,2,4-Trichlorobenzene	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
95-63-6	1,2,4-Trimethylbenzene	3.6	4	3.6	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
96-12-8	1,2-Dibromo-3-chloropropane	NS	NS	NS	0.0035	U	0.0031	U	0.0032	U	0.0034	U	0.0034	U	0.0043	U	0.0037	U	0.0043	U	0.0039	U	0.0045	U	0.004	U
106-93-4	1,2-Dibromoethane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
95-50-1	1,2-Dichlorobenzene	1.1	500	1.1	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
107-06-2	1,2-Dichloroethane	0.02	30	0.02	0.0017	U	0.0015	U	0.0016	U	**0.032**		0.0017	U	0.0021	U	0.0019	U	**0.005**		0.0019	U	0.0023	U	0.002	U
78-87-5	1,2-Dichloropropane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
108-67-8	1,3,5-Trimethylbenzene	8.4	8	8.4	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
541-73-1	1,3-Dichlorobenzene	2.4	280	2.4	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
142-28-9	1,3-Dichloropropane	NS	NS	NS	0.00087	U	0.00076	U	0.00079	U	0.00084	U	0.00086	U	0.0011	U	0.00093	U	0.0011	U	0.00097	U	0.0011	U	0.00099	U
106-46-7	1,4-Dichlorobenzene	1.8	130	1.8	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
123-91-1	1,4-Dioxane	0.1	130	0.1	0.087	U	0.076	U	0.079	U	0.084	U	0.086	U	0.11	U	0.093	U	0.11	U	0.097	U	0.11	U	0.099	U
594-20-7	2,2-Dichloropropane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	0.035	U	0.031	U	0.032	U	0.034	U	**0.074**		0.043	U	0.037	U	0.043	U	0.039	U	0.045	U	0.04	U
95-49-8	2-Chlorotoluene	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
591-78-6	2-Hexanone (Methyl butyl ketone)	NS	NS	NS	0.017	U	0.015	U	0.016	U	0.017	U	0.017	U	0.021	U	0.019	U	0.022	U	0.019	U	0.023	U	0.02	U
106-43-4	4-Chlorotoluene	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
99-87-6	4-Isopropyltoluene	NS	NS	NS																						
108-10-1	4-Methyl-2-pentanone	NS	NS	NS	0.017	U	0.015	U	0.016	U	0.017	U	0.017	U	0.021	U	0.019	U	0.022	U	0.019	U	0.023	U	0.02	U
67-64-1	Acetone	0.05	500	0.05	0.087	U	**0.17**		0.079	U	**0.38**		**4 (Note 4)**		0.11	U	0.093	U	0.11	U	**0.17**		0.11	U	0.099	U
107-13-1	Acrylonitrile	NS	NS	NS	0.0052	U	0.0046	U	0.0048	U	0.0051	U	0.0051	U	0.0064	U	0.0056	U	0.0065	U	0.0058	U	0.0068	U	0.0059	U
71-43-2	Benzene	0.06	44	0.06	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
108-86-1	Bromobenzene	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
74-97-5	Bromochloromethane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
75-27-4	Bromodichloromethane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
75-25-2	Bromoform	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
74-83-9	Bromomethane	NS	NS	NS	0.0087	U	0.0076	U	0.0079	U	0.0084	U	0.0086	U	0.011	U	0.0093	U	0.011	U	0.0097	U	0.011	U	0.0099	U
75-15-0	Carbon disulfide	NS	NS	NS	0.0052	U	0.0046	U	0.0048	U	0.0051	U	0.0051	U	0.0064	U	0.0056	U	0.0065	U	0.0058	U	0.0068	U	0.0059	U
56-23-5	Carbon tetrachloride	0.76	22	0.76	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
108-90-7	Chlorobenzene	1.1	500	1.1	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
75-00-3	Chloroethane	NA	NS	NA	0.017	U	0.015	U	0.016	U	0.017	U	0.017	U	0.021	U	0.019	U	0.022	U	0.019	U	0.023	U	0.02	U
67-66-3	Chloroform	0.37	350	0.37	0.0035	U	0.0031	U	0.0032	U	0.0034	U	0.0034	U	0.0043	U	0.0037	U	0.0043	U	0.0039	U	0.0045	U	0.004	U
74-87-3	Chloromethane	NS	NS	NS	0.0087	U	0.0076	U	0.0079	U	0.0084	U	0.0086	U	0.011	U	0.0093	U	0.011	U	0.0097	U	0.011	U	0.0099	U
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
10061-01-5	cis-1,3-Dichloropropene	NS	NS	NS	0.00087	U	0.00076	U	0.00079	U	0.00084	U	0.00086	U	0.0011	U	0.00093	U	0.0011	U	0.00097	U	0.0011	U	0.00099	U
110-82-7	Cyclohexane	NS	NS	NS																						
124-48-1	Dibromochloromethane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
74-95-3	Dibromomethane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
75-71-8	Dichlorodifluoromethane	NS	NS	NS	0.017	U	0.015	U	0.016	U	0.017	U	0.017	U	0.021	U	0.019	U	0.022	U	0.019	U	0.023	U	0.02	U
60-29-7	Diethyl Ether	NS	NS	NS	0.017	U	0.015	U	0.016	U	0.017	U	0.017	U	0.021	U	0.019	U	0.022	U	0.019	U	0.023	U	0.02	U
108-20-3	Diisopropyl Ether (DIPE)	NS	NS	NS	0.00087	U	0.00076	U	0.00079	U	0.00084	U	0.00086	U	0.0011	U	0.00093	U	0.0011	U	0.00097	U	0.0011	U	0.00099	U
100-41-4	Ethylbenzene	1.0	390	1.0	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
87-68-3	Hexachlorobutadiene	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
74-88-4	Iodomethane	NS	NS	NS																						
98-82-8	Isopropylbenzene	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
1330-20-7	m,p-Xylene	0.26	0	0.26	0.0035	U	0.0031	U	0.0032	U	0.0034	U	0.0034	U	0.0043	U	0.0037	U	0.0043	U	0.0039	U	0.0045	U	0.004	U
79-20-9	Methyl acetate	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
1634-04-4	Methyl tert-butyl ether	0.93	500	0.93	0.0035	U	0.0031	U	0.0032	U	0.0034	U	0.0034	U	0.0043	U	0.0037	U	0.0043	U	0.0039	U	0.0045	U	0.004	U
108-87-2	Methylcyclohexane	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
75-09-2	Methylene chloride	0.05	500	0.05	0.017	U	0.015	U	0.016	U	0.017	U	0.017	U	0.021	U	0.019	U	0.022	U	0.019	U	0.023	U	0.02	U
104-51-8	n-Butylbenzene	12	12	12	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
103-65-1	n-Propylbenzene	3.9	4	3.9	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
91-20-3	Naphthalene	12	12	12	0.0035	U	0.0031	U	0.0032	U	0.0034	U	0.0034	U	0.0043	U	0.0037	U	0.0043	U	0.0039	U	0.0045	U	0.004	U
95-47-6	o-Xylene	NS	0	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
99-87-6	p-Isopropyltoluene (p-Cymene)	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
135-98-8	sec-Butylbenzene	11	11	11	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
100-42-5	Styrene	NS	NS	NS	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
994-05-8	tert-Amyl Methyl Ether (TAME)	NS	NS	NS	0.00087	U	0.00076	U	0.00079	U	0.00084	U	0.00086	U	0.0011	U	0.00093	U	0.0011	U	0.00097	U	0.0011	U	0.00099	U
75-65-0	tert-Butyl Alcohol (TBA)	NS	NS	NS	0.035	U	0.031	U	0.032	U	0.034	U	0.034	U	0.043	U	0.037	U	0.043	U	0.039	U	0.045	U	0.04	U
637-92-3	tert-Butyl Ethyl Ether (TBEE)	NS	NS	NS	0.00087	U	0.00076	U	0.00079	U	0.00084	U	0.00086	U	0.0011	U	0.00093	U	0.0011	U	0.00097	U	0.0011	U	0.00099	U
98-06-6	tert-Butylbenzene	5.9	6	5.9	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
127-18-4	Tetrachloroethene	1.3	150	1.3	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
109-99-9	Tetrahydrofuran	NS	NS	NS	0.0087	U	0.0076	U	0.0079	U	0.0084	U	0.0086	U	0.011	U	0.0093	U	0.011	U	0.0097	U	0.011	U	0.0099	U
108-88-3	Toluene	0.7	500	0.7	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
156-60-5	trans-1,2-Dichloroethene	0.19	500	0.19	0.0017	U	0.0015	U	0.0016	U	0.0017	U	0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
10061-02-6	trans-1,3-Dichloropropene	NS	NS	NS	0.00087	U	0.00076	U	0.00079	U	0.00084	U	0.00086	U	0.0011	U	0.00093	U	0.0011	U	0.00097	U	0.0011	U	0.00099	U
110-57-6	trans-1,4-Dichloro-2-butene	NS	NS	NS	0.0035	U	0.0031	U	0.0032	U	0.0034	U	0.0034	U	0.0043	U	0.0037	U	0.0043	U	0.0039	U	0.0045	U	0.004	U
79-01-6	Trichloroethene	0.47	200	0.47	0.0017	U	0.0015	U	0.0016	U	**0.0096**		0.0017	U	0.0021	U	0.0019	U	0.0022	U	0.0019	U	0.0023	U	0.002	U
75-69-4	Trichlorofluoromethane	NS	NS	NS	0.0087	U	0.0076	U	0.0079	U	0.0084	U	0.0086	U	0.011	U	0.0093	U	0.011	U	0.0097	U	0.011	U	0.0099	U
108-05-4	Vinyl acetate	NS	NS	NS																						
75-01-4	Vinyl chloride	0.02	13	0.02	0.0087	U	0.0076	U	0.0079	U	0.0084	U	0.0086	U	0.011	U	0.0093	U	0.011	U	0.0097	U	0.011	U	0.0099	U
1330-20-7	Xylene (Total)	1.6	500	1.6																						
Total VOC					**2.565**		**0.172**		**0.003**		**1.212**		**4.074**		**0.0025**		**ND**		**0.161**		**0.187**		**ND**		**ND**	
Total CVOC					**2.565**		**0.002**		**0.003**		**0.832**		**0.074**		**0.0025**		**ND**		**0.161**		**0.0165**		**ND**		**ND**	

Notes:
See last page, page 8 for Notes.

Notes:

(1) The Method Detection Limits are listed for non-detect data where available. The Reporting Limit is listed for the April 2017 data as this is what is provided in the laboratory analytical reports.

BOLD - The compound was detected at a concentration above the method detection limit (MDL).

BOLD/BLUE SHADING - The compound was detected above Part 375 Restricted Soil Cleanup Objectives for Protection of Groundwater (within the treatment area).

(2) Acronyms
- NS - No Criteria established for the compound
- NA - Not applicable
- NL - data not located
- U/ND - The compound was not detected at a concentration greater than or equal to the MDL.
  limit (RL) but greater than MDL.
- E - Results exceed calibration range.
- D - The reported value is from a secondary dilution analysis factor.
- B - The compound was also detected in the associated Method Blank.
- R - Sample result rejected, presence/absence of analyte not verified.
- H - Sample was prepped or analyzed beyond the specified holding time.

(3) Grey shading/Blank cells: data not available from documentation or parameter not analyzed.
- (a) 1998 MHC boring data only available in report data tables. MDL not provided for non-detect data.
- (b) The O&G 2007. Data that was not located in Table 5 of the 2007 O&G report is shown as grey. Lab report not available to confirm data availability.
- (c) August 2011 "SB-" boring data. Minimal data with MDL not provided for non-detects. No lab report to confirm data availability.
- (d) 2012 "TW-" boring parameter not analyzed.
- (e) December 2016 "DC-ISB" and April 2017 "PR-SB" boring parameter not analyzed based on analytical data.

(4) The highest value is presented when two analytical results are provided due to dilution or a wet vs. dry sample.

Table 2-4
Groundwater Analytical Results, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Well ID: BIW-1S

CAS No.	VOC (µg/L)	AWQS/GV	11/27/2012	11/4/2013	1/18/2014	4/17/2014	7/16/2014	12/29/2014	4/23/2015	10/8/2015	10/19/2016	5/23/2018	6/5/2019	11/2/2021
71-55-6	1,1,1-Trichloroethane	5	9.4	NS	3,300 D	3,300 D	3,200 D	2,200 D	3,900 D*^	2,100 D	2,400 D	5,200 D	1,800 D	80 U
75-34-3	1,1-Dichloroethane	5	3.5	NS	1,500 D	2,000 D	3,300 D	1,200 D	2,700 D	3,300 D	6,800 F1	4,800 D	2,100 D	60 J
107-06-2	1,2-Dichloroethane	0.6	0.33 J	NS	280 D	320	440 D	110 D	200 D	460 D	730 D	1,100 D	450 D	80 U
75-00-3	Chloroethane	5	1.00 U	NS	80.0 U	80.0 U	55.0 D	110 D	180 D	500 D	1,900 D	14,000 D	17,000 D	5,300
75-35-4	1,1-Dichloroethene	5	1.00 U	NS	220 D	540 D	580 D	160 D	46 D	52 DJ	93 DJ	830 D	290 D	80 U
127-18-4	Tetrachloroethene	5	0.54 J	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
79-01-6	Trichloroethene	5	2.5	NS	68.0 DJ	83.0 D	110 D	47	46 D	100 U	48 DJ	100 U, D	200 U, D	80 U
156-59-2	cis-1,2-Dichloroethene	5	0.91 J	NS	80.0 U	80.0 U	40.0 U	40.0 U	40 D	220 D	550 D	570 D	200 U, D	80 U
75-01-4	Vinyl chloride	2	1.00 U	NS	80.0 U	80.0 U	39.0 DJ	40.0 U	40.0 U	100 U	100 U	200 U, D	400 U, D	80 U
78-93-3	2-Butanone	50(GV)	10.00 U	NS	1,200 D	1,300 D	1,900 D	370 DJ	410 D	430 DJ	750 DJ	2,000 U, D	4,000 U, D	800 U
67-64-1	Acetone	50 (GV)	10.00 U	NS	800 U	800 U	380 DJ	300 DJ	260 DJ	320 DJ	910 DJ	5,000 U, D	10,000 U, D	800 U
108-87-2	Methylcyclohexane	50	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
79-34-5	1,1,2,2-Tetrachloroethane	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	50 U, D	100 U, D	80 U
79-00-5	1,1,2-Trichloroethane	1	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluroethane	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
120-82-1	1,2,4-Trichlorobenzene	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
96-12-8	1,2-Dibromo-3-chloropropane	0.04	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	500 U, D	1,000 U, D	80 U
106-93-4	1,2-Dibromoethane	NA	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	50 U, D	100 U, D	80 U
95-50-1	1,2-Dichlorobenzene	3	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
78-87-5	1,2-Dichloropropane	1	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
541-73-1	1,3-Dichlorobenzene	3	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
106-46-7	1,4-Dichlorobenzene	3	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
594-20-7	2-Hexanone	50	5.00 U	NS	400 U	400 U	200 U	70 DJ	140 DJ	200 DJ	100 U	1,000 U, D	2,000 U, D	400 U
108-10-1	4-Methyl-2-pentanone	NA	5.00 U	NS	400 U	400 U	200 U	200 U	200 U	500 U	500 U	1,000 U, D	2,000 U, D	400 U
71-43-2	Benzene	1	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
75-27-4	Bromodichloromethane	50(GV)	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	50 U, D	100 U, D	80 U
75-25-2	Bromoform	50(GV)	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
74-83-9	Bromomethane	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	200 U, D	400 U, D	80 U
75-15-0	Carbon disulfide	NA	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	400 U, D	1,000 U, D	80 U
56-23-5	Carbon tetrachloride	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	500 U, D	1,000 U, D	80 U
108-90-7	Chlorobenzene	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
67-66-3	Chloroform	7	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	200 U, D	400 U, D	80 U
74-87-3	Chloromethane	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	200 U, D	400 U, D	80 U
10061-01-5	cis-1,3-Dichloropropene	0.4	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	50 U, D	100 U, D	80 U
10061-02-6	trans-1,3-Dichloropropene		1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	50 U, D	100 U, D	80 U
110-82-7	Cyclohexane	NA	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	NS	NS	80 U
124-48-1	Dibromochloromethane	50(GV)	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	NS	NS	80 U
75-71-8	Dichlorodifluoromethane	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	200 U, D	400 U, D	80 U
100-41-4	Ethylbenzene	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
98-82-8	Isopropylbenzene	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
79-20-9	Methyl acetate	NA	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	200 U
1634-04-4	Methyl tert-butyl ether	10(GV)	1.8	NS	80.0 U	80.0 U	7.8 DJ	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
75-09-2	Methylene chloride	5	1.00 U	NS	80.0 U	80.0 U	19 DJ	40.0 U	40.0 U	100 U	100 U	500 U, D	1,000 U, D	80 U
100-42-5	Styrene	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
108-88-3	Toluene	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
156-60-5	trans-1,2-Dichloroethene	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	100 U, D	200 U, D	80 U
75-69-4	Trichlorofluoromethane	5	1.00 U	NS	80.0 U	80.0 U	40.0 U	40.0 U	40.0 U	100 U	100 U	200 U, D	400 U, D	80 U
1330-20-7	Xylenes, Total	100	2.00 U	NS	160 U	160 U	80.0 U	80.0 U	80.0 U	200 U	200 U	100 U, D	200 U, D	160 U
	Total CVOCs	NA	17.2	NA	5,368	6,243	7,743	3,827	7,112	6,632	12,521	26,500	21,640	5,360
	Total CVOCs - Chloroethane	NA	17.2	NA	5,368	6,243	7,688	3,717	6,932	6,132	10,621	12,500	4,640	60
	Total VOCs	NA	19.0	NA	6,568	7,543	10,031	4,567	7,922	7,582	14,181	26,500	21,640	5,360
	Dissolved Gases (µg/L)													
74-84-0	Ethane	NA	7.5 U	NS	NS	NS	NS	NS	NS	NS	NS	3.6 U	7.8 U	33 U
74-85-1	Ethene	NA	7.0 U	NS	NS	NS	NS	NS	NS	NS	NS	4.5 U	9.2 U	33 U
74-82-8	Methane	NA	100	NS	NS	NS	NS	NS	NS	NS	NS	6,900 D	8,400	14,000
	General Chemistry (mg/L)													
14808-79-8	Sulfate	250,000	18.1	NS	40.0 U	0.51 J	NS	NS	NS	NS	NS	0.92 U	0.73 J	1.5 U
NA	Total Organic Carbon	NA	1.5	10,400	3,720 D	2,840 D	NS	586 D	NS	NS	NS	1,200 D	300	101
	Metals (µg/L)													
7440-38-2	Arsenic	25	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-89-6	Iron	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-96-5	Manganese	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Biological Analyses (cells/mL)													
NA	Dehalococcoides (Dhc)	NA	3.00E+03 U	NS	NS	NS	NS	NS	NS	NS	NS	1.10E+00 J	2.18E+05	1.41E+04
NA	Dehalobacter (Dhb)	NA	4.00E+03 U	NS	NS	NS	NS	NS	NS	NS	NS	3.70E+05	8.38E+05	1.30E+04
NA	tceA Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.00E+00 J	1.84E+04	2.69E+02
NA	BAV1 VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.00E-01 J	1.39E+03	1.30E+02
NA	VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.90E+00 U	9.15E+03	6.05E+02
	Water Quality Parameters													
NA	pH	NA	7.39	NS	5.33	5.85	5.66	5.47	5.76	5.74	5.72	6.00	6.97	6.81
NA	ORP (mV)	NA	17.9	NS	75.0	44.0	-22.0	33.1	-51.9	-24.0	-101.0	-8.0	-99.1	-85.3
NA	Dissolved Oxygen (mg/L)	NA	--	--	--	--	--	--	--	--	--	0.66	0.15	0.17

Well ID: BIW-1D

CAS No.	VOC (µg/L)	AWQS/GV	11/27/2012	11/4/2013	1/18/2014	4/17/2014	7/16/2014	12/29/2014	4/23/2015	10/7/2015	10/19/2016	5/23/2018	6/5/2019	11/2/2021
71-55-6	1,1,1-Trichloroethane	5	3,600 D	NS	97.0 D	8.6 D	10.0 U	47 D	2.2 ^	5.0 U	19 D	2.0 U, D	2.0 U, D	20 U
75-34-3	1,1-Dichloroethane	5	2,400 D	NS	1,900 E	87.0 D	350 D	95 D	6.0	31 D	73 D	3.6 D	2.0 U, D	21
107-06-2	1,2-Dichloroethane	0.6	160 D	NS	160 D	6.5 D	87.0 D	48 D	14	32 D	11 D	3.7 D	2.0 U, D	20 U
75-00-3	Chloroethane	5	50.0 U	NS	32.0 D	8.7 D	620 D	530 D	120	260 D	110 D	160 D	220 D	820 F1
75-35-4	1,1-Dichloroethene	5	73.0 D	NS	11.0 D	2.2 DJ	10.0 U	7.3 DJ	1.1 J	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
127-18-4	Tetrachloroethene	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
79-01-6	Trichloroethene	5	50.0 U	NS	5.3 DJ	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
156-59-2	cis-1,2-Dichloroethene	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.4 D	2.0 U, D	2.0 U, D	20 U
75-01-4	Vinyl chloride	2	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	4.0 U, D	4.0 U, D	20 U
78-93-3	2-Butanone	50(GV)	50.0 U	NS	430 D	10.0 DJ	210 D	72 DJ	14 J	41 DJ^	19 DJ	40 U, D	40 U, D	200 U
67-64-1	Acetone	50 (GV)	50.0 U	NS	91.0 DJ	22.0 DJ	1,500 D	710 D	110	280 D	460 D	100 U, D	100 U, D	200 U
108-87-2	Methylcyclohexane	50	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
79-34-5	1,1,2,2-Tetrachloroethane	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	1.0 U, D	1.0 U, D	20 U
79-00-5	1,1,2-Trichloroethane	1	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluroethane	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
120-82-1	1,2,4-Trichlorobenzene	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
96-12-8	1,2-Dibromo-3-chloropropane	0.04	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	10 U, D	10 U, D	20 U F1
106-93-4	1,2-Dibromoethane	NA	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	1.0 U, D	1.0 U, D	20 U F1
95-50-1	1,2-Dichlorobenzene	3	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
78-87-5	1,2-Dichloropropane	1	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
541-73-1	1,3-Dichlorobenzene	3	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
106-46-7	1,4-Dichlorobenzene	3	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
594-20-7	2-Hexanone	50	250.0 U	NS	50.0 U	25.0 U	50.0 U	50.0 U	10 U	25 U	25 U	20 U, D	20 U, D	100 U F1
108-10-1	4-Methyl-2-pentanone	NA	250.0 U	NS	50.0 U	25.0 U	50.0 U	50.0 U	10 U	25 U	25 U	20 U, D	20 U, D	100 U
71-43-2	Benzene	1	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
75-27-4	Bromodichloromethane	50(GV)	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	1.0 U, D	1.0 U, D	20 U
75-25-2	Bromoform	50(GV)	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U F1
74-83-9	Bromomethane	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	4.0 U, D	4.0 U, D	20 U
75-15-0	Carbon disulfide	NA	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	8.0 U, D	10 U, D	20 U
56-23-5	Carbon tetrachloride	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	10 U, D	10 U, D	20 U
108-90-7	Chlorobenzene	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
67-66-3	Chloroform	7	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	4.0 U, D	4.0 U, D	20 U
74-87-3	Chloromethane	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	4.0 U, D	4.0 U, D	20 U
10061-01-5	cis-1,3-Dichloropropene	0.4	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	1.0 U, D	1.0 U, D	20 U
10061-02-6	trans-1,3-Dichloropropene		50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	1.0 U, D	1.0 U, D	20 U F1
110-82-7	Cyclohexane	NA	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	NS	NS	20 U
124-48-1	Dibromochloromethane	50(GV)	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	NS	NS	20 U F1
75-71-8	Dichlorodifluoromethane	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	4.0 U, D	4.0 U, D	20 U
100-41-4	Ethylbenzene	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
98-82-8	Isopropylbenzene	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
79-20-9	Methyl acetate	NA	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	50 U
1634-04-4	Methyl tert-butyl ether	10(GV)	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
75-09-2	Methylene chloride	5	50.0 U	NS	4.5 DJ	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	10 U, D	10 U, D	20 U
100-42-5	Styrene	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
108-88-3	Toluene	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
156-60-5	trans-1,2-Dichloroethene	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	2.0 U, D	2.0 U, D	20 U
75-69-4	Trichlorofluoromethane	5	50.0 U	NS	10.0 U	5.0 U	10.0 U	10.0 U	2.0 U	5.0 U	5.0 U	4.0 U, D	4.0 U, D	20 U
1330-20-7	Xylenes, Total	100	100 U	NS	20.0 U	10.0 U	20.0 U	20.0 U	4.0 U	10 U	10 U	2.0 U, D	2.0 U, D	40 U
	Total CVOCs	NA	6,233	NA	2,731	113	1,057	727	143	323	218	167.3	220	841
	Total CVOCs - Chloroethane	NA	6,233	NA	2,699	104	437	197	23.3	63	108	7	NA	21
	Total VOCs	NA	6,233	NA	2,731	145	2,767	1,509	267	644	697	167.3	220	841
	Dissolved Gases (µg/L)													
74-84-0	Ethane	NA	7.5 U	NS	NS	150 U	75.0 U	750 U	750 U	750 U	750 U	3.6 U	7.8 U	330 U
74-85-1	Ethene	NA	7.0 U	NS	NS	140 U	70.0 U	700 U	700 U	700 U	700 U	4.5 U	9.2 U	330 U
74-82-8	Methane	NA	2.4 J	NS	NS	1,500 D	2,700 D	2,400 D	13,000	9,600 D	5,100 D	7,300 D	16,000	19,000
	General Chemistry (mg/L)													
14808-79-8	Sulfate	250,000	35.2	NS	40.0 U	6.5	NS	NS	NS	NS	NS	0.92 U	1.9	1.5 U F1
NA	Total Organic Carbon	NA	1.0 U	2,390	1,200 D	74.0	1,090 D	586 D	88.8 B	196 D	82.1 D	33	24 W-18, Z-01	18.1
	Metals (µg/L)													
7440-38-2	Arsenic	25	NS	NS	17	NS	NS	28	15	120	42	NS	NS	NS
7439-89-6	Iron	300	NS	NS	108,000	NS	NS	89,800	20,400	295,000	25,600	NS	NS	NS
7439-96-5	Manganese	300	NS	NS	8,900	NS	NS	4,500 B	940	10,700	680	NS	NS	NS
	Biological Analyses (cells/mL)													
NA	Dehalococcoides (Dhc)	NA	2.00E+03 U	NS	NS	NS	2.00E+03 J	2.00E+03 J	3.00E+04	6.46E+06	4.51E+07	2.81E+03	6.42E+04	1.18E+04
NA	Dehalobacter (Dhb)	NA	6.00E+04	NS	NS	NS	1.00E+06	5.00E+05	1.00E+05	5.46E+06	2.78E+07	1.48E+03	1.73E+04	4.70E+00 U
NA	tceA Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.31E+02	1.57E+03	1.73E+02
NA	BAV1 VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.20E+00 U	1.50E+00 J	5.00E-01 U
NA	VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.42E+01	2.32E+02	2.13E+01
	Water Quality Parameters													
NA	pH	NA	7.73	NS	5.93	6.77	6.18	6.05	5.85	6.83	6.68	6.85	6.56	6.74
NA	ORP (mV)	NA	40.9	NS	30.0	-41.0	-25.0	-27.7	-117.8	-109.9	-81.0	-32.0	-89.8	107.6
NA	Dissolved Oxygen (mg/L)	NA	--	--	--	--	--	--	--	--	--	0.96	0.02	0.23

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - Not Applicable
NS - Not Sampled
U/ND - The compound was not detected at a concentration greater than or equal to the MDL.
CVOC - Chlorinated Volatile Organic Compound
J - The concentration given is an approximate value. The concentration is less than the reporting limit (RL) and greater than or equal to the MDL.
D - The reported value is from a secondary dilution analysis factor.
E - The compound concentration exceeded the calibration range.
F1 - Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) recovery is outside accepted limits.
* Laboratory control sample (LCS) or LCS Duplicate (LCSD) exceeds the control limits.
B - Compound was found in the blank and sample.
H - Sample was prepped or analyzed beyond the specified holding time.
^ - Instrument related QC is outside acceptance limit.
MS-09 - Matrix spike recovery and/or matri spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.
V-05 - Continuing calibration did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
V-34 - Initial calibration verification (ICV) id not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
L-04 - Laboratory fortified blank/laboratory control sample recovery and duplicate recovery are outside of control limits. Reported value for this compound is likely to be biased on the low side.
MS-07A - Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery. Possiblity of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.

Table 2-4
Groundwater Analytical Results, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

CAS No.	Well ID / Date / VOC (μg/L)	AWQS/GV	BIW-2S 11/30/2012	BIW-2S 11/4/2013	BIW-2S 1/18/2014	BIW-2S 4/17/2014	BIW-2S 7/16/2014	BIW-2S 12/30/2014	BIW-2S 4/23/2015	BIW-2S 10/7/2015	BIW-2S 10/19/2016	BIW-2S 5/23/2018	BIW-2S 6/5/2019	BIW-2S 11/3/2021
71-55-6	**1,1,1-Trichloroethane**	5	**5,200 D**	NS	**19.0 D**	**14.0 D**	**24.0 D**	**12 D**	**17 D*^**	**6.6 D**	40 U	10 U, D	10 U, D	40 U
75-34-3	**1,1-Dichloroethane**	5	**8,500 D**	NS	**360 D**	**89.0 D**	**260 D**	**310 D**	**280 D**	**360 D**	40 U	10 U, D	10 U, D	40 U
107-06-2	**1,2-Dichloroethane**	0.6	**170 D**	NS	**170 D**	**31.0 D**	**120 D**	**160 D**	**270 D**	**410 D**	**28 DJ**	10 U, D	10 U, D	40 U
75-00-3	**Chloroethane**	5	**1,000 D**	NS	**190 D**	**57.0 D**	**300 D**	**370 D**	**710 D**	**2,600 D**	**1,500 D**	**1,000 D**	**1,200 D**	**970**
75-35-4	**1,1-Dichloroethene**	5	**420 D**	NS	10.0 U	**4.6 DJ**	**7.0 D**	**8.7 D**	**5.6 DJ**	**11 D**	40 U	10 U, D	10 U, D	40 U
127-18-4	**Tetrachloroethene**	5	**1.5**	NS	**6.3 DJ**	**11.0 D**	**4.1 DJ**	**2.2 DJ**	**3.6 DJ**	**1.9 DJ**	40 U	10 U, D	10 U, D	40 U
79-01-6	**Trichloroethene**	5	**11.0**	NS	**13.0 D**	**46.0 D**	**17.0 D**	**6.4 D**	**6 DJ**	**9.0 D**	40 U	10 U, D	10 U, D	40 U
156-59-2	**cis-1,2-Dichloroethene**	5	**910 D**	NS	**34.0 D**	**110 D**	**99.0 D**	**70 D**	**37 D**	**61 D**	40 U	10 U, D	10 U, D	40 U
75-01-4	**Vinyl chloride**	2	**150 D**	NS	10.0 U	**49.0 D**	**15.0 D**	10.0 U	10.0 U	5.0 U	40 U	20 U, D	20 U, D	40 U
78-93-3	**2-Butanone**	50(GV)	**2.8 J**	NS	**300 D**	**77.0 D**	**230 D**	**230 D**	**390 D**	**220 D^**	**120 DJ**	200 U, D	200 U, D	400 U
67-64-1	**Acetone**	50 (GV)	**3.6 J**	NS	**120 D**	**86.0 D**	**280 D**	**300 D**	**460 D**	**220 D**	**230 DJ**	500 U, D	500 U, D	400 U
108-87-2	**Methylcyclohexane**	50	**0.76 J**	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	5.0 U, D	5.0 U, D	40 U
79-00-5	**1,1,2-Trichloroethane**	1	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
76-13-1	**1,1,2-Trichloro-1,2,2-trifluroethane**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
120-82-1	**1,2,4-Trichlorobenzene**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
96-12-8	**1,2-Dibromo-3-chloropropane**	0.04	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	50 U, D	50 U, D	40 U
106-93-4	**1,2-Dibromoethane**	NA	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	5.0 U, D	5.0 U, D	40 U
95-50-1	**1,2-Dichlorobenzene**	3	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
78-87-5	**1,2-Dichloropropane**	1	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
541-73-1	**1,3-Dichlorobenzene**	3	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
106-46-7	**1,4-Dichlorobenzene**	3	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
594-20-7	**2-Hexanone**	50	5.0 U	NS	50.0 U	25.0 U	**130 D**	25.0 U	**18 DJ**	**370 D**	40 U	100 U, D	100 U, D	200 U
108-10-1	**4-Methyl-2-pentanone**	NA	5.0 U	NS	50.0 U	25.0 U	25.0 U	**12.0 DJ**	50.0 U	25.0 U	40 U	100 U, D	100 U, D	200 U
71-43-2	**Benzene**	1	**1.1**	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
75-27-4	**Bromodichloromethane**	50(GV)	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	5.0 U, D	5.0 U, D	40 U
75-25-2	**Bromoform**	50(GV)	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
74-83-9	**Bromomethane**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	20 U, D	20 U, D	40 U
75-15-0	**Carbon disulfide**	NA	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	40 U, D	50 U, D	40 U
56-23-5	**Carbon tetrachloride**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	50 U, D	50 U, D	40 U
108-90-7	**Chlorobenzene**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
67-66-3	**Chloroform**	7	**0.52 J**	NS	10.0 U	**7.6 D**	**5.1 D**	5.0 U	10.0 U	5.0 U	40 U	20 U, D	20 U, D	40 U
74-87-3	**Chloromethane**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	20 U, D	20 U, D	40 U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	5.0 U, D	5.0 U, D	40 U
10061-02-6	**trans-1,3-Dichloropropene**		1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	5.0 U, D	5.0 U, D	40 U
110-82-7	**Cyclohexane**	NA	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	NS	NS	40 U
124-48-1	**Dibromochloromethane**	50(GV)	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	NS	NS	40 U
75-71-8	**Dichlorodifluoromethane**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	20 U, D	20 U, D	40 U
100-41-4	**Ethylbenzene**	5	**1.2**	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
98-82-8	**Isopropylbenzene**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
79-20-9	**Methyl acetate**	NA	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	**59 D**	100 U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	**6.2**	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	**2.7 DJ**	40 U	10 U, D	10 U, D	40 U
75-09-2	**Methylene chloride**	5	**1.2**	NS	10.0 U	**2.3 DJ**	5.0 U	**2.9 DJ**	10.0 U	5.0 U	40 U	50 U, D	50 U, D	40 U
100-42-5	**Styrene**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
108-88-3	**Toluene**	5	**25.0**	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
156-60-5	**trans-1,2-Dichloroethene**	5	**10.0**	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	10 U, D	10 U, D	40 U
75-69-4	**Trichlorofluoromethane**	5	1.0 U	NS	10.0 U	5.0 U	5.0 U	5.0 U	10.0 U	5.0 U	40 U	20 U, D	20 U, D	40 U
1330-20-7	**Xylenes, Total**	100	**4.7**	NS	20.0 U	10.0 U	10.0 U	10.0 U	20.0 U	10 U	80 U	10 U, D	10 U, D	80 U
	Total CVOCs	NA	**16,374**	NA	**792**	**422**	**851**	**942**	**1,329**	**3,460**	**1,528**	**1,000**	**1,200**	**970**
	Total CVOCs - Chloroethane	NA	**15,374**	NA	**602**	**365**	**551**	**572.2**	**619**	**860**	**28.0**	NA	NA	NA
	Total VOCs	NA	**16,420**	NA	**1,212**	**585**	**1,491**	**1,484**	**2,197**	**4,272**	**1,878**	**1,000**	**1,259**	**970**
	Dissolved Gases (μg/L)													
74-84-0	**Ethane**	NA	**22.0**	NS	NS	NS	NS	750 U	750 U	750 U	750 U	**4.2 J**	7.8 U	33 U
74-85-1	**Ethene**	NA	**13.0**	NS	NS	NS	NS	700 U	700 U	700 U	700 U	4.5 U	9.2 U	33 U
74-82-8	**Methane**	NA	**340**	NS	NS	NS	NS	**480 D**	**1,200**	**9,200 D**	**1,300 D**	**11,000 D**	**12,000**	**10,000**
	General Chemistry (mg/L)													
14808-79-8	**Sulfate**	250,000	**46,001**	NS	**14.1 DJ**	**0.36 J**	NS	NS	NS	NS	NS	**5.8**	**1.0**	**1.9 J**
NA	**Total Organic Carbon**	NA	**4.1**	**3,010**	**1,710 D**	**515 D**	**1,400 D**	**861 D**	**452 ^**	**571**	**181**	**250 D**	**180**	**58.1**
	Metals (μg/L)													
7440-38-2	**Arsenic**	25	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-89-6	**Iron**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-96-5	**Manganese**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Biological Analyses (cells/mL)													
NA	**Dehalococcoides (Dhc)**	NA	**2.00E+06**	NS	NS	NS	NS	NS	NS	NS	NS	**7.96E+03**	**8.28E+04**	**9.06E+02**
NA	**Dehalobacter (Dhb)**	NA	**6.00E+06**	NS	NS	NS	NS	NS	NS	NS	NS	**3.29E+04**	**4.28E+01**	6.40E+00 U
NA	**tceA Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	**2.43E+04**	**7.99E+03**	**6.80E+00**
NA	**BAV1 VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	**3.20E+00 J**	3.10E+00 U	6.00E-01 U
NA	**VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	**1.68E+03**	**7.42E+03**	**5.30E+00**
	Water Quality Parameters													
NA	**pH**	NA	**7.31**	NS	**6.02**	**6.32**	**5.34**	**5.31**	**5.92**	**6.96**	**6.85**	**6.92**	**6.89**	**6.59**
NA	**ORP (mV)**	NA	**-41.8**	NS	**10.0**	**-95.0**	**22.0**	**35.7**	**-101.3**	**-129.8**	**-122.0**	**51.2**	**-71.7**	**-79.8**
NA	**Dissolved Oxygen (mg/L)**	NA	--	--	--	--	--	--	--	--	--	**1.12**	**0.45**	**0.24**

CAS No.	Well ID / Date / VOC (μg/L)	AWQS/GV	BIW-2D 11/30/2012	BIW-2D 11/4/2013	BIW-2D 1/18/2014	BIW-2D 4/17/2014	BIW-2D 7/16/2014	BIW-2D 12/30/2014	BIW-2D 4/23/2015	BIW-2D 10/7/2015	BIW-2D 10/19/2016
71-55-6	**1,1,1-Trichloroethane**	5	**3.3**	NS	1.0 U	2.0 U	1.0 U	1.0 U	**18 *^**	**5.7**	1.0 U
75-34-3	**1,1-Dichloroethane**	5	**21.0**	NS	**70.0**	**4.7 D**	**2.7**	**1.1**	**300 D**	**5.2**	**0.51 J**
107-06-2	**1,2-Dichloroethane**	0.6	1.0 U	NS	**2.4**	**2.3 D**	**0.64 J**	1.0 U	**220 D**	**0.72 J**	**1.5**
75-00-3	**Chloroethane**	5	1.0 U	NS	**2.1**	**52.0 D**	**17.0**	**12**	**650 D**	**25.0**	**72.0**
75-35-4	**1,1-Dichloroethene**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	**8.4**	1.0 U	1.0 U
127-18-4	**Tetrachloroethene**	5	**2.4**	NS	1.0 U	**1.2 DJ**	1.0 U	1.0 U	**2.8**	1.0 U	1.0 U
79-01-6	**Trichloroethene**	5	**16.0**	NS	**0.50 J**	**3.6**	1.0 U	1.0 U	**8.3**	1.0 U	1.0 U
156-59-2	**cis-1,2-Dichloroethene**	5	**2.0**	NS	1.0 U	**8.4 D**	1.0 U	1.0 U	**43**	1.0 U	**0.91 J**
75-01-4	**Vinyl chloride**	2	1.0 U	NS	1.0 U	**3.5**	1.0 U	1.0 U	**3.1**	1.0 U	1.0 U
78-93-3	**2-Butanone**	50(GV)	10.0 U	NS	**2.3 J**	**3.5 DJ**	10.0 U	10.0 U	**190**	10 U	10 U
67-64-1	**Acetone**	50 (GV)	**4.7 J**	NS	**4.9 J**	**6.4 DJ**	10.0 U	10.0 U	**210**	10 U	10 U
108-87-2	**Methylcyclohexane**	50	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
79-00-5	**1,1,2-Trichloroethane**	1	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
76-13-1	**1,1,2-Trichloro-1,2,2-trifluroethane**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
120-82-1	**1,2,4-Trichlorobenzene**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
96-12-8	**1,2-Dibromo-3-chloropropane**	0.04	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
106-93-4	**1,2-Dibromoethane**	NA	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
95-50-1	**1,2-Dichlorobenzene**	3	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
78-87-5	**1,2-Dichloropropane**	1	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
541-73-1	**1,3-Dichlorobenzene**	3	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
106-46-7	**1,4-Dichlorobenzene**	3	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
594-20-7	**2-Hexanone**	50	5.0 U	NS	5.0 U	10.0 U	5.0 U	5.0 U	**9.4**	5.0 U	5.0 U
108-10-1	**4-Methyl-2-pentanone**	NA	5.0 U	NS	5.0 U	10.0 U	5.0 U	5.0 U	**5.5**	5.0 U	5.0 U
71-43-2	**Benzene**	1	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	**0.46 J**	1.0 U	1.0 U
75-27-4	**Bromodichloromethane**	50(GV)	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
75-25-2	**Bromoform**	50(GV)	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
74-83-9	**Bromomethane**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
75-15-0	**Carbon disulfide**	NA	1.0 U	NS	1.0 U	**0.55 DJ**	1.0 U	1.0 U	1.0 U	1.0 U	**0.24 J**
56-23-5	**Carbon tetrachloride**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
108-90-7	**Chlorobenzene**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
67-66-3	**Chloroform**	7	**0.99 J**	NS	1.0 U	2.0 U	1.0 U	1.0 U	**0.85 J**	1.0 U	1.0 U
74-87-3	**Chloromethane**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
10061-02-6	**trans-1,3-Dichloropropene**		1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
110-82-7	**Cyclohexane**	NA	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
124-48-1	**Dibromochloromethane**	50(GV)	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
75-71-8	**Dichlorodifluoromethane**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
100-41-4	**Ethylbenzene**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
98-82-8	**Isopropylbenzene**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
79-20-9	**Methyl acetate**	NA	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	**0.72 J**	1.0 U	1.0 U
75-09-2	**Methylene chloride**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	**0.97 J**	1.0 U	1.0 U
100-42-5	**Styrene**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
108-88-3	**Toluene**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
156-60-5	**trans-1,2-Dichloroethene**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
75-69-4	**Trichlorofluoromethane**	5	1.0 U	NS	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1330-20-7	**Xylenes, Total**	100	2.0 U	NS	2.0 U	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Total CVOCs	NA	**45.7**	NA	**75.0**	**75.7**	**20.3**	**13.1**	**1,255**	**36.6**	**74.9**
	Total CVOCs - Chloroethane	NA	**45.7**	NA	**72.9**	**23.7**	**3.3**	**1.1**	**605**	**11.6**	**2.9**
	Total VOCs	NA	**50.4**	NA	**82.2**	**86.2**	**20.3**	**13.1**	**1,672**	**36.6**	**75.2**
	Dissolved Gases (μg/L)										
74-84-0	**Ethane**	NA	7.5 U	NS	NS	NS	NS	NS	NS	NS	NS
74-85-1	**Ethene**	NA	7.0 U	NS	NS	NS	NS	NS	NS	NS	NS
74-82-8	**Methane**	NA	**35.0**	NS	NS	NS	NS	NS	NS	NS	NS
	General Chemistry (mg/L)										
14808-79-8	**Sulfate**	250,000	**42.8**	NS	**24.5**	**3.6**	NS	NS	NS	NS	NS
NA	**Total Organic Carbon**	NA	1.0 U	**11.4**	**23.4**	**25.0**	1.0 U	**0.93 J**	NS	NS	NS
	Metals (μg/L)										
7440-38-2	**Arsenic**	25	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-89-6	**Iron**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-96-5	**Manganese**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Biological Analyses (cells/mL)										
NA	**Dehalococcoides (Dhc)**	NA	1.00E+03 U	NS	NS	NS	NS	NS	NS	NS	NS
NA	**Dehalobacter (Dhb)**	NA	2.00E+03 U	NS	NS	NS	NS	NS	NS	NS	NS
NA	**tceA Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	**BAV1 VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	**VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Water Quality Parameters										
NA	**pH**	NA	**7.80**	NS	**7.08**	**7.35**	**7.21**	**6.99**	**7.23**	**7.71**	**7.20**
NA	**ORP (mV)**	NA	**-5.4**	NS	**-98.0**	**-88.0**	**-42.0**	**-59.2**	**-228.8**	**-123.4**	**-179.0**
NA	**Dissolved Oxygen (mg/L)**	NA	--	--	--	--	--	--	--	--	--

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
μg/L - micrograms per liter
mg/L - milligrams per liter
NA - Not Applicable
NS - Not Sampled
U/ND - The compoud was not detected at a concentration greater than or equal to the MDL.
CVOC - Chlorinated Volatile Organic Compound
J - The concentration given is an approximate value. The concentration is less than the reporting limit (RL) and greater than or equal to the MDL.
D - The reported value is from a secondary dilution analysis factor.
E - The compound concentration exceeded the calibration range.
F1 - MS and/or MSD recovery is outside accepted limits
* Laboratory control sample (LCS) or LCS Duplicate (LCSD) exceeds the control limits.
B - Compound was found in the blank and sample.
H - Sample was prepped or analyzed beyond the specified holding time
^ - Instrument related QC is outside acceptance limit
MS-09 - Matrix spike recovery and/or matri spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.
V-05 - Continuing calibration did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
V-34 - Initial calibration verification (ICV) id not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
L-04 - Laboratory fortified blank/laboratory control sample recovery and duplicate recovery are outside of control limits. Reported value for this compound is likely to be biased on the low side.
MS-07A - Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery. Possiblity of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.

Table 2-4
Groundwater Analytical Results, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Well ID		AWQS/GV	BIW-3S					BIW-3D					BIW-4				
Date			11/28/2012	12/30/2014	4/23/2015	10/8/2015	10/19/2016	11/29/2012	12/30/2014	4/23/2015	10/8/2015	10/19/2016	11/29/2012	12/29/2014	4/23/2015	10/8/2015	10/19/2016
CAS No.	*VOC (µg/L)*																
71-55-6	**1,1,1-Trichloroethane**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	**19**	NS	1.0 U	1.0 U
75-34-3	**1,1-Dichloroethane**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	**0.77** J	NS	1.0 U	1.0 U	1.0 U	**15**	NS	1.0 U	1.0 U
107-06-2	**1,2-Dichloroethane**	0.6	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	**0.27** J	NS	1.0 U	1.0 U	1.0 U	**1.2**	NS	1.0 U	1.0 U
75-00-3	**Chloroethane**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	**0.67** J	NS	**0.60** J	1.0 U	1.0 U	**7.1**	NS	1.0 U	1.0 U
75-35-4	**1,1-Dichloroethene**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	**1.0**	NS	1.0 U	1.0 U
127-18-4	**Tetrachloroethene**	5	**6.2**	1.0 UH	NS	1.0 U	1.0 U	**0.86** J	1.0 U	NS	1.0 U	1.0 U	**3.7**	1.0 U	NS	1.0 U	1.0 U
79-01-6	**Trichloroethene**	5	**6.1**	**2.5** H	NS	**1.7**	1.0 U	**0.90** J	**0.66** J	NS	1.0 U	1.0 U	**2.7**	**0.92** J	NS	1.0 U	1.0 U
156-59-2	**cis-1,2-Dichloroethene**	5	1.0 U	**0.99** JH	NS	**0.96** J	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	**0.82** J	NS	**1.2**	**0.83** J
75-01-4	**Vinyl chloride**	2	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	**1.2**	1.0 U
78-93-3	**2-Butanone**	50(GV)	10.0 U	10.0 UH	NS	10 U	10 U	10.0 U	10.0 U	NS	10.00 U	10.00 U	10.0 U	10.0 U	NS	10 U	10 U
67-64-1	**Acetone**	50 (GV)	**6.3** J	**6.3** H	NS	10 U	10 U	**7.7** J	10.0 U	NS	10.00 U	10.00 U	**8.1** J	10.0 U	NS	10 U	10 U
108-87-2	**Methylcyclohexane**	50	1.0 U	**0.48** JH	NS	1.0 U	1.0 U	**2.6**	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
79-00-5	**1,1,2-Trichloroethane**	1	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
76-13-1	**1,1,2-Trichloro-1,2,2-trifluroethane**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
120-82-1	**1,2,4-Trichlorobenzene**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
96-12-8	**1,2-Dibromo-3-chloropropane**	0.04	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
106-93-4	**1,2-Dibromoethane**	NA	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
95-50-1	**1,2-Dichlorobenzene**	3	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
78-87-5	**1,2-Dichloropropane**	1	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
541-73-1	**1,3-Dichlorobenzene**	3	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
106-46-7	**1,4-Dichlorobenzene**	3	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
594-20-7	**2-Hexanone**	50	5.0 U	5.0 UH	NS	5.0 U	5.0 U	5.0 U	5.0 U	NS	5.0 U	5.0 U	5.0 U	5.0 U	NS	5.0 U	5.0 U
108-10-1	**4-Methyl-2-pentanone**	NA	5.0 U	5.0 UH	NS	5.0 U	5.0 U	5.0 U	5.0 U	NS	5.0 U	5.0 U	5.0 U	5.0 U	NS	5.0 U	5.0 U
71-43-2	**Benzene**	1	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-27-4	**Bromodichloromethane**	50(GV)	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-25-2	**Bromoform**	50(GV)	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
74-83-9	**Bromomethane**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-15-0	**Carbon disulfide**	NA	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
56-23-5	**Carbon tetrachloride**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
108-90-7	**Chlorobenzene**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
67-66-3	**Chloroform**	7	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
74-87-3	**Chloromethane**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
10061-02-6	**trans-1,3-Dichloropropene**		1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
110-82-7	**Cyclohexane**	NA	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
124-48-1	**Dibromochloromethane**	50(GV)	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-71-8	**Dichlorodifluoromethane**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
100-41-4	**Ethylbenzene**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
98-82-8	**Isopropylbenzene**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
79-20-9	**Methyl acetate**	NA	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1.0 U	1.0 UH	NS	1.0 U	1.0 U	**4.3**	**2.1**	NS	**1.8**	**0.32** J	1.0 U	1.0 U	NS	1.0 U	**0.21** J
75-09-2	**Methylene chloride**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
100-42-5	**Styrene**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
108-88-3	**Toluene**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
156-60-5	**trans-1,2-Dichloroethene**	5	1.0 U	1.0 UH	NS	1.0 U	**2.0**	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	**1.2**	**0.95** J
75-69-4	**Trichlorofluoromethane**	5	1.0 U	1.0 UH	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
1330-20-7	**Xylenes, Total**	100	2.0 U	2.0 UH	NS	2.0 U	2.0 U	2.0 U	2.0 U	NS	2.0 U	2.0 U	2.0 U	2.0 U	NS	2.0 U	2.0 U
Total CVOCs		NA	**12.3**	**3.49**	NA	**2.7**	**2.0**	**1.8**	**2.4**	NA	**0.6**	ND	**6.4**	**45.0**	NA	**3.6**	**1.8**
Total CVOCs - Chloroethane		NA	**12.3**	**3.49**	NA	**2.7**	**2.0**	**1.8**	**1.7**	NA	ND	ND	**6.4**	**37.9**	NA	**3.6**	**1.8**
Total VOCs		NA	**18.6**	**10.3**	NA	**2.7**	**2.0**	**16.4**	**4.5**	NA	**2.4**	**0.32**	**14.5**	**45.0**	NA	**3.6**	**2.0**
	Dissolved Gases (µg/L)																
74-84-0	**Ethane**	NA	7.5 U	NS	NS	NS	NS	7.5 U	NS	NS	NS	NS	7.5 U	NS	NS	NS	NS
74-85-1	**Ethene**	NA	7.0 U	NS	NS	NS	NS	7.0 U	NS	NS	NS	NS	7.0 U	NS	NS	NS	NS
74-82-8	**Methane**	NA	**98.0**	NS	NS	NS	NS	**22.0**	NS	NS	NS	NS	**5.6**	NS	NS	NS	NS
	General Chemistry (mg/L)																
14808-79-8	**Sulfate**	250,000	**27.3**	NS	NS	NS	NS	**46.6**	NS	NS	NS	NS	**32.0**	NS	NS	NS	NS
NA	**Total Organic Carbon**	NA	**0.71** J	NS	NS	NS	NS	**1.2**	NS	NS	NS	NS	**0.43** J	NS	NS	NS	NS
	Metals (µg/L)																
7440-38-2	**Arsenic**	25	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-89-6	**Iron**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-96-5	**Manganese**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Biological Analyses (cells/mL)																
NA	**Dehalococcoides (Dhc)**	NA	**2.00E+03** J	NS	NS	NS	NS	1.00E+03 U	NS	NS	NS	NS	3.00E+04 U	NS	NS	NS	NS
NA	**Dehalobacter (Dhb)**	NA	**2.00E+05**	NS	NS	NS	NS	**1.00E+04**	NS	NS	NS	NS	**1.00E+04** J	NS	NS	NS	NS
NA	**tceA Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	**BAV1 VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	**VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Water Quality Parameters																
NA	**pH**	NA	**7.71**	**6.95**	NS	**7.23**	**8.26**	**8.31**	**7.13**	NS	**7.81**	**9.03**	**7.63**	**7.03**	NS	**7.37**	**7.25**
NA	**ORP (mV)**	NA	**21.4**	**-72.3**	NS	**-223.2**	**-142.0**	**7.7**	**-48.4**	NS	**-131.5**	**-122.0**	**18.4**	**-82.5**	NS	**-135.2**	**-93.0**
NA	**Dissolved Oxygen (mg/L)**	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - Not Applicable
NS - Not Sampled
U/ND - The compoud was not detected at a concentration greater than or equal to the MDL.
CVOC - Chlorinated Volatile Organic Compound
J - The concentration given is an approximate value. The concentration is less than the reporting limit (RL) and greater than or equal to the MDL.
D - The reported value is from a secondary dilution analysis factor.
E - The compound concentration exceeded the calibration range.
F1 - MS and/or MSD recovery is outside accepted limits
* Laboratory control sample (LCS) or LCS Duplicate (LCSD) exceeds the control limits.
B - Compound was found in the blank and sample.
H - Sample was prepped or analyzed beyond the specified holding time
^ - Instrument related QC is outside acceptance limit
MS-09 - Matrix spike recovery and/or matri spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.
V-05 - Continuing calibration did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
V-34 - Initial calibration verification (ICV) id not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
L-04 - Laboratory fortified blank/laboratory control sample recovery and duplicate recovery are outside of control limits. Reported value for this compound is likely to be biased on the low side.
MS-07A - Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery. Possiblity of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.

Table 2-4
Groundwater Analytical Results, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

CAS No.	Well ID / Date / VOC (µg/L)	AWQS/GV	BIW-5S 11/27/2012	BIW-5S 11/4/2013	BIW-5S 1/18/2014	BIW-5S 4/17/2014	BIW-5S 7/16/2014	BIW-5S 12/29/2014	BIW-5S 4/23/2015	BIW-5S 10/7/2015	BIW-5S 10/19/2016	BIW-5S 5/23/2018	BIW-5S 6/5/2019	BIW-5S 11/2/2021
71-55-6	1,1,1-Trichloroethane	5	560 D	NS	760 D	990 D	1,500 D	2,500 D	250 D^	2,200 D	32,000 D	200 U, D	50 U, D	34 J
75-34-3	1,1-Dichloroethane	5	810 D	NS	10,000 D	12,000 D	16,000 D	31,000 D	1,800 D	27,000 D	36,000 D	580 D	150 D	73
107-06-2	1,2-Dichloroethane	0.6	77.0 D	NS	2,600 D	2,900 D	3,400 D	5,500 D	330 D	4,300 D	4,400 D	200 U, D	50 U, D	40 U
75-00-3	Chloroethane	5	150 D	NS	22,000 D	22,000 D	25,000 D	37,000 D	1,900 D	31,000 D	71,000 D	36,000 D	5,400 D	1,600
75-35-4	1,1-Dichloroethene	5	10.0 U	NS	180 D	270 DJ	210 DJ	470 D	34 DJ	450 D	1,100 D	640 D	50 U, D	40 U
127-18-4	Tetrachloroethene	5	13.0 D	NS	5.1 D	400 U	400 U	400 U	40 U	35 DJ	800 U	200 U, D	50 U, D	40 U
79-01-6	Trichloroethene	5	46.0 D	NS	18.0 D	400 U	400 U	400 U	40 U	96 D	800 U	200 U, D	50 U, D	40 U
156-59-2	cis-1,2-Dichloroethene	5	81.0 D	NS	320 D	320 DJ	390 DJ	650 D	55 D	940 D	840 D	400 D	50 U, D	40 U
75-01-4	Vinyl chloride	2	16.0 D	NS	18.0 D	400 U	400 U	400 U	40 U	61 D	800 U	730 D	100 U, D	40 U
78-93-3	2-Butanone	50(GV)	100 U	NS	26.0 DJ	4,000 U	4,000 U	4,000 U	400 U	350 DJ^	8,000 U	4,000 U, D	1,000 U, D	400 U
67-64-1	Acetone	50 (GV)	100 U	NS	480 D	4,000 U	4,000 U	4,000 U	400 U	470 D	8,000 U	10,000 U, D	2,500 U, D	400 U
108-87-2	Methylcyclohexane	50	65.0 D	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
79-34-5	1,1,2,2-Tetrachloroethane	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	100 U, D	25 U, D	40 U
79-00-5	1,1,2-Trichloroethane	1	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluroethane	5	42.0 D	NS	42.0 D	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
120-82-1	1,2,4-Trichlorobenzene	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
96-12-8	1,2-Dibromo-3-chloropropane	0.04	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	1,000 U, D	250 U, D	40 U
106-93-4	1,2-Dibromoethane	NA	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	100 U, D	25 U, D	40 U
95-50-1	1,2-Dichlorobenzene	3	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
78-87-5	1,2-Dichloropropane	1	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
541-73-1	1,3-Dichlorobenzene	3	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
106-46-7	1,4-Dichlorobenzene	3	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
594-20-7	2-Hexanone	50	50.0 U	NS	50.0 U	2,000 U	2,000 U	2,000 U	200 U	200 U	4,000 U	2,000 U, D	500 U, D	200 U
108-10-1	4-Methyl-2-pentanone	NA	50.0 U	NS	50.0 U	2,000 U	2,000 U	2,000 U	200 U	200 U	4,000 U	2,000 U, D	500 U, D	200 U
71-43-2	Benzene	1	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
75-27-4	Bromodichloromethane	50(GV)	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	100 U, D	25 U, D	40 U
75-25-2	Bromoform	50(GV)	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
74-83-9	Bromomethane	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	400 U, D	100 U, D	40 U
75-15-0	Carbon disulfide	NA	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	800 U, D	250 U, D	40 U
56-23-5	Carbon tetrachloride	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	1,000 U, D	250 U, D	40 U
108-90-7	Chlorobenzene	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
67-66-3	Chloroform	7	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	400 U, D	100 U, D	40 U
74-87-3	Chloromethane	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	400 U, D	100 U, D	40 U
10061-01-5	cis-1,3-Dichloropropene	0.4	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	100 U, D	25 U, D	40 U
10061-02-6	trans-1,3-Dichloropropene		10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	100 U, D	25 U, D	40 U
110-82-7	Cyclohexane	NA	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	NS	NS	40 U
124-48-1	Dibromochloromethane	50(GV)	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	NS	NS	40 U
75-71-8	Dichlorodifluoromethane	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	400 U, D	100 U, D	40 U
100-41-4	Ethylbenzene	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
98-82-8	Isopropylbenzene	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
79-20-9	Methyl acetate	NA	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	100 U
1634-04-4	Methyl tert-butyl ether	10(GV)	10.0 U	NS	59.0 D	400 U	83 DJ	120 DJ	40 U	90 D	800 U	200 U, D	50 U, D	40 U
75-09-2	Methylene chloride	5	10.0 U	NS	40.0 D	400 U	400 U	400 U	40 U	47 D	800 U	1,000 U, D	250 U, D	40 U
100-42-5	Styrene	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
108-88-3	Toluene	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
156-60-5	trans-1,2-Dichloroethene	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	200 U, D	50 U, D	40 U
75-69-4	Trichlorofluoromethane	5	10.0 U	NS	10.0 U	400 U	400 U	400 U	40 U	40 U	800 U	400 U, D	100 U, D	40 U
1330-20-7	Xylenes, Total	100	20.0 U	NS	20.0 U	800 U	800 U	800 U	80 U	80 U	1600 U	200 U, D	50 U, D	80 U
	Total CVOCs	NA	1,795	NA	35,983	38,480	46,500	77,120	4,369	66,129	145,340	38,350	5,550	1,707
	Total CVOCs - Chloroethane	NA	1,645	NA	13,983	16,480	21,500	40,120	2,469	35,129	74,340	2,350	150	107
	Total VOCs	NA	1,860	NA	36,548	38,480	46,583	77,240	4,369	67,039	145,340	38,350	5,550	1,707
	Dissolved Gases (µg/L)													
74-84-0	Ethane	NA	380 U	NS	NS	150 U	75.0 U	750 U	750 U	750 U	750 U	42	35	33 U
74-85-1	Ethene	NA	350 U	NS	NS	140 U	18.0 J	700 U	700 U	700 U	700 U	360	9.2 U	33 U
74-82-8	Methane	NA	390 D	NS	NS	1,100 D	1,300 D	810 D	1,400	2,800	550 D	850	13,000	16,000
	General Chemistry (mg/L)													
14808-79-8	Sulfate	250,000	4.0	NS	40.0 U	4.1	NS	NS	NS	NS	NS	0.92 U	19	3.3 J
NA	Total Organic Carbon	NA	2.8	41.7	2,050 D	2,190 D	1,740 D	2,110 D	70.9 B	1,290	987 D	360 D	160	26.6
	Metals (µg/L)													
7440-38-2	Arsenic	25	NS	NS	14.0	NS	NS	21	15 U	14 J	31	NS	NS	NS
7439-89-6	Iron	300	NS	NS	261,000	NS	NS	334,000	31,500	289,000	204,000	NS	NS	NS
7439-96-5	Manganese	300	NS	NS	19,800	NS	NS	22,300 B	2,100	16,700	9,100	NS	NS	NS
	Biological Analyses (cells/mL)													
NA	Dehalococcoides (Dhc)	NA	3.00E+06	NS	NS	NS	8.00E+04	2.00E+03 J	1.00E+03 J	1.51E+05	1.12E+09	1.62E+03	1.01E+05	1.88E+03
NA	Dehalobacter (Dhb)	NA	2.00E+06	NS	NS	NS	3.00E+06	4.00E+06	4.00E+06	8.16E+06	4.20E+09	1.57E+04	6.67E+03	6.35E+02
NA	tceA Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.19E+03	6.14E+03	1.02E+01
NA	BAV1 VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	8.35E+02	9.99E+03	4.00E+00
NA	VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	4.50E+02	1.03E+04	4.08E+01
	Water Quality Parameters													
NA	pH	NA	7.48	NS	5.36	5.39	5.50	5.30	6.90	6.10	5.70	6.17	6.50	6.38
NA	ORP (mV)	NA	-26.9	NS	50.0	19.0	-24.0	33.1	22.3	-76.3	-89.0	-33.0	-95.7	-75.0
NA	Dissolved Oxygen (mg/L)	NA	--	--	--	--	--	--	--	--	--	1.14	1.63	0.18

CAS No.	Well ID / Date / VOC (µg/L)	AWQS/GV	BIW-5D 11/28/2012	BIW-5D 11/4/2013	BIW-5D 1/18/2014	BIW-5D 4/17/2014	BIW-5D 7/16/2014	BIW-5D 12/29/2014	BIW-5D 4/23/2015	BIW-5D 10/7/2015	BIW-5D 10/19/2016	BIW-5D 5/23/2018	BIW-5D 6/5/2019	BIW-5D 11/2/2021
71-55-6	1,1,1-Trichloroethane	5	33,000 D	NS	7,300 D	7,300 D	18,000 D	47,000 D	9,400 D^	3,800 D	1,700 D	88 D	1,000 U, D	2,000
75-34-3	1,1-Dichloroethane	5	80,000 D	NS	66,000 D	69,000 D	84,000 D	48,000 D	18,000 D	32,000 D	13,000 D	980 D	1,800 D	21,000
107-06-2	1,2-Dichloroethane	0.6	6,800 D	NS	5,000 D	5,000 D	5,300 D	5,400 D	1,300 D	2,600 D	1,500 D	120 D	1,000 U, D	1,700
75-00-3	Chloroethane	5	490 DJ	NS	11,000 D	19,000 D	29,000 D	38,000 D	3,600 D	28,000 D	82,000 D	4,900 D	48,000 D	35,000
75-35-4	1,1-Dichloroethene	5	1,900 D	NS	840 D	1,300 D	3,500 D	3,000 D	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
127-18-4	Tetrachloroethene	5	56.0	NS	21.0 D	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
79-01-6	Trichloroethene	5	49.0	NS	27.0 D	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
156-59-2	cis-1,2-Dichloroethene	5	3.9	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
75-01-4	Vinyl chloride	2	210 E	NS	140 D	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	100 U, D	2,000 U, D	1,000 U
78-93-3	2-Butanone	50(GV)	280	NS	79.0 DJ	10,000 U	20,000 U	20,000 U	5,000 U	5,000 U	5,000 U	1,000 U, D	20,000 U, D	10,000 U
67-64-1	Acetone	50 (GV)	740 E	NS	160 D	10,000 U	20,000 U	20,000 U	5,000 U	5,000 U	5,000 U	2,500 U, D	50,000 U, D	10,000 U
108-87-2	Methylcyclohexane	50	0.47 J	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
79-34-5	1,1,2,2-Tetrachloroethane	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	25 U, D	500 U, D	1,000 U
79-00-5	1,1,2-Trichloroethane	1	1.0	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluroethane	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
120-82-1	1,2,4-Trichlorobenzene	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
96-12-8	1,2-Dibromo-3-chloropropane	0.04	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	250 U, D	5,000 U, D	1,000 U
106-93-4	1,2-Dibromoethane	NA	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	25 U, D	500 U, D	1,000 U
95-50-1	1,2-Dichlorobenzene	3	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
78-87-5	1,2-Dichloropropane	1	5.0	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
541-73-1	1,3-Dichlorobenzene	3	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
106-46-7	1,4-Dichlorobenzene	3	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
594-20-7	2-Hexanone	50	5.0 U	NS	50.0 U	5,000 U	10,000 U	10,000 U	2,500 U	2,500 U	2,500 U	500 U, D	10,000 U, D	5,000 U
108-10-1	4-Methyl-2-pentanone	NA	34.0	NS	50.0 U	5,000 U	10,000 U	10,000 U	2,500 U	2,500 U	2,500 U	500 U, D	10,000 U, D	5,000 U
71-43-2	Benzene	1	3.0	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
75-27-4	Bromodichloromethane	50(GV)	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	25 U, D	500 U, D	1,000 U
75-25-2	Bromoform	50(GV)	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
74-83-9	Bromomethane	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	100 U, D	2,000 U, D, MS-07A	1,000 U
75-15-0	Carbon disulfide	NA	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	200 U, D	5,000 U, D	1,000 U
56-23-5	Carbon tetrachloride	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	250 U, D	5,000 U, D	1,000 U
108-90-7	Chlorobenzene	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
67-66-3	Chloroform	7	22.0	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	100 U, D	2,000 U, D	1,000 U
74-87-3	Chloromethane	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	100 U, D	2,000 U, D	1,000 U
10061-01-5	cis-1,3-Dichloropropene	0.4	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	25 U, D	500 U, D	1,000 U
10061-02-6	trans-1,3-Dichloropropene		1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	25 U, D	500 U, D	1,000 U
110-82-7	Cyclohexane	NA	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	NS	NS	1,000 U
124-48-1	Dibromochloromethane	50(GV)	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	NS	NS	1,000 U
75-71-8	Dichlorodifluoromethane	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	100 U, D	2,000 U, D	1,000 U
100-41-4	Ethylbenzene	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
98-82-8	Isopropylbenzene	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
79-20-9	Methyl acetate	NA	0.90 J	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	2,500 U
1634-04-4	Methyl tert-butyl ether	10(GV)	73.0	NS	56.0 D	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
75-09-2	Methylene chloride	5	25.0	NS	30.0 D	1,000 U	2,200 D	2,000 U	500 U	500 U	500 U	250 U, D	5,000 U, D	1,000 U
100-42-5	Styrene	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
108-88-3	Toluene	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
156-60-5	trans-1,2-Dichloroethene	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	50 U, D	1,000 U, D	1,000 U
75-69-4	Trichlorofluoromethane	5	1.0 U	NS	10.0 U	1,000 U	2,000 U	2,000 U	500 U	500 U	500 U	100 U, D	2,000 U, D	1,000 U
1330-20-7	Xylenes, Total	100	2.0 U	NS	20.0 U	2,000 U	4,000 U	4,000 U	1,000 U	1,000 U	1,000 U	50 U, D	1,000 U, D	2,000 U
	Total CVOCs	NA	122,562	NA	90,358	101,600	142,000	141,400	32,300	66,400	98,200	6,088	49,800	59,700
	Total CVOCs - Chloroethane	NA	122,072	NA	79,358	82,600	113,000	103,400	28,700	38,400	16,200	1,188	1,800	24,700
	Total VOCs	NA	123,693	NA	90,653	101,600	142,000	141,400	32,300	66,400	98,200	6,088	49,800	59,700
	Dissolved Gases (µg/L)													
74-84-0	Ethane	NA	7.5 U	NS	NS	7.5 U	7.5 U	75 U	75 U	75 U	150 U	6.4 J	890	370
74-85-1	Ethene	NA	24.0	NS	NS	12.0	50.0	40 DJ	70 U	240 D	210 D	200	160	110 J
74-82-8	Methane	NA	41.0	NS	NS	49.0	110	160 D	99 D	320 D	760 D	560	9,600	14,000
	General Chemistry (mg/L)													
14808-79-8	Sulfate	250,000	64.2 D	NS	2.0 U	2.0 U	NS	NS	NS	NS	NS	7.8	0.83 J	1.9 J
NA	Total Organic Carbon	NA	21.0	2,850	50.7	40.6	52.3	65.4	11.5 B	77.1	88.1	15	130	93.5
	Metals (µg/L)													
7440-38-2	Arsenic	25	NS	NS	24	NS	NS	24	9.7 J	14 J	22	NS	NS	NS
7439-89-6	Iron	300	NS	NS	32,800	NS	NS	28,500	5,800	18,600	40,100	NS	NS	NS
7439-96-5	Manganese	300	NS	NS	1,300	NS	NS	1,800 B	530	1,300	2,400	NS	NS	NS
	Biological Analyses (cells/mL)													
NA	Dehalococcoides (Dhc)	NA	2.00E+03	NS	NS	NS	3.00E+06	4.00E+05	2.00E+07	4.87E+07	6.02E+08	9.72E+03	2.21E+04	2.30E+05
NA	Dehalobacter (Dhb)	NA	7.00E+05	NS	NS	NS	5.00E+07	4.00E+07	1.00E+07	8.77E+07	4.52E+09	2.13E+05	2.33E+05	1.16E+05
NA	tceA Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.65E+03	2.17E+02	5.85E+02
NA	BAV1 VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.41E+01	1.69E+02	2.33E+03
NA	VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.77E+03	1.93E+03	6.30E+03
	Water Quality Parameters													
NA	pH	NA	7.28	NS	7.33	6.56	6.51	6.27	6.51	7.03	6.20	6.91	6.23	6.54
NA	ORP (mV)	NA	-57.6	NS	-42.0	-60.0	-94.0	-22.8	-124.9	-102.0	-92.0	-74.7	-76.5	-96.6
NA	Dissolved Oxygen (mg/L)	NA	--	--	--	--	--	--	--	--	--	0.74	0.07	0.13

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - Not Applicable
NS - Not Sampled
U/ND - The compoud was not detected at a concentration greater than or equal to the MDL.
CVOC - Chlorinated Volatile Organic Compound
J - The concentration given is an approximate value. The concentration is less than the reporting limit (RL) and greater than or equal to the MDL.
D - The reported value is from a secondary dilution analysis factor.
E - The compound concentration exceeded the calibration range.
F1 - MS and/or MSD recovery is outside accepted limits
* Laboratory control sample (LCS) or LCS Duplicate (LCSD) exceeds the control limits.
B - Compound was found in the blank and sample.
H - Sample was prepped or analyzed beyond the specified holding time
^ - Instrument related QC is outside acceptance limit
MS-09 - Matrix spike recovery and/or matri spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.
V-05 - Continuing calibration did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
V-34 - Initial calibration verification (ICV) id not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
L-04 - Laboratory fortified blank/laboratory control sample recovery and duplicate recovery are outside of control limits. Reported value for this compound is likely to be biased on the low side.
MS-07A - Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery. Possiblity of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.

Table 2-4
Groundwater Analytical Results, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Well ID		AWQS/GV	BIW-6S									BIW-6D				
Date			11/28/2012	11/4/2013	1/18/2014	4/17/2014	7/16/2014	12/29/2014	4/23/2015	10/8/2015	10/19/2016	11/28/2012	12/30/2014	4/23/2015	10/8/2015	10/19/2016
CAS No.	*VOC (µg/L)*															
71-55-6	**1,1,1-Trichloroethane**	5	**42.0**	NS	10.0 U	2.0 U	20.0 U	**3.4 DJ**	1.0 U	5.0 U	**6.8 D**	**0.82 J**	1.0 U	NS	1.0 U	1.0 U
75-34-3	**1,1-Dichloroethane**	5	**120 D**	NS	**44.0 D**	**4.7 D**	**21.0 D**	**18 D**	**8.2**	5.0 U	**80.0 D**	**34.0**	1.0 U	NS	1.0 U	**0.41 J**
107-06-2	**1,2-Dichloroethane**	0.6	**53.0**	NS	**20.0 D**	**1.9 DJ**	**11.0 DJ**	**14 D**	**12**	5.0 U	**10.0 D**	**2.8**	**1.8**	NS	**0.72 J**	1.0 U
75-00-3	**Chloroethane**	5	1.0 U	NS	**11.0 D**	**1.4 DJ**	**24.0 D**	**250 D**	**190 D**	**170 D**	**270 D**	1.0 U	**67**	NS	**26**	**18**
75-35-4	**1,1-Dichloroethene**	5	**10.0**	NS	10.0 U	2.0 U	20.0 U	**2.6 DJ**	**1.7**	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
127-18-4	**Tetrachloroethene**	5	**5.9**	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
79-01-6	**Trichloroethene**	5	**35.0**	NS	10.0 U	**1.8 DJ**	20.0 U	4.0 U	**1.8**	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
156-59-2	**cis-1,2-Dichloroethene**	5	**4.4**	NS	**47.0 D**	**2.5 D**	20.0 U	**3.3 DJ**	**4.9**	5.0 U	**4.2 DJ**	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-01-4	**Vinyl chloride**	2	**2.2**	NS	10.0 U	2.0 U	20.0 U	4.0 U	**2.1**	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
78-93-3	**2-Butanone**	50(GV)	10.0 U	NS	**35.0 DJ**	**6.5 DJ**	**39.0 DJ**	**46 D**	**45**	50 U	**25 DJ**	10.0 U	10.0 U	NS	10 U	10 U
67-64-1	**Acetone**	50 (GV)	**8.2 J**	NS	**220 D**	**58.0 D**	**1,500 D**	**1,300 D**	**1,100 D**	**97 D**	**65 D**	**9.2 J**	**8.4 J**	NS	10 U	10 U
108-87-2	**Methylcyclohexane**	50	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	**0.32 J**	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
79-00-5	**1,1,2-Trichloroethane**	1	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
76-13-1	**1,1,2-Trichloro-1,2,2-trifluroethane**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
120-82-1	**1,2,4-Trichlorobenzene**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
96-12-8	**1,2-Dibromo-3-chloropropane**	0.04	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
106-93-4	**1,2-Dibromoethane**	NA	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
95-50-1	**1,2-Dichlorobenzene**	3	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
78-87-5	**1,2-Dichloropropane**	1	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
541-73-1	**1,3-Dichlorobenzene**	3	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
106-46-7	**1,4-Dichlorobenzene**	3	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
594-20-7	**2-Hexanone**	50	5.0 U	NS	50.0 U	10.0 U	100 U	**8.9 DJ**	**8.4**	25 U	25 U	5.0 U	5.0 U	NS	5.0 U	5.0 U
108-10-1	**4-Methyl-2-pentanone**	NA	5.0 U	NS	50.0 U	**6.4 DJ**	100 U	**11 DJ**	**8.1**	25 U	25 U	5.0 U	5.0 U	NS	5.0 U	5.0 U
71-43-2	**Benzene**	1	**0.76 J**	NS	10.0 U	2.0 U	20.0 U	**2.2 DJ**	**2.1**	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-27-4	**Bromodichloromethane**	50(GV)	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-25-2	**Bromoform**	50(GV)	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
74-83-9	**Bromomethane**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-15-0	**Carbon disulfide**	NA	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	**0.83 J**	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
56-23-5	**Carbon tetrachloride**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
108-90-7	**Chlorobenzene**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
67-66-3	**Chloroform**	7	**0.76 J**	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
74-87-3	**Chloromethane**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
10061-02-6	**trans-1,3-Dichloropropene**		1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
110-82-7	**Cyclohexane**	NA	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
124-48-1	**Dibromochloromethane**	50(GV)	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-71-8	**Dichlorodifluoromethane**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
100-41-4	**Ethylbenzene**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
98-82-8	**Isopropylbenzene**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
79-20-9	**Methyl acetate**	NA	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	**8.2**	NS	10.0 U	2.0 U	20.0 U	**2.9 DJ**	**2.7**	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-09-2	**Methylene chloride**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
100-42-5	**Styrene**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
108-88-3	**Toluene**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	**0.84 J**	5.0 U	**3.5 DJ**	1.0 U	1.0 U	NS	1.0 U	1.0 U
156-60-5	**trans-1,2-Dichloroethene**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
75-69-4	**Trichlorofluoromethane**	5	1.0 U	NS	10.0 U	2.0 U	20.0 U	4.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U
1330-20-7	**Xylenes, Total**	100	2.0 U	NS	20.0 U	4.0 U	40.0 U	8.0 U	2.0 U	10 U	10 U	2.0 U	2.0 U	NS	2.0 U	2.0 U
Total CVOCs		NA	**273**	NA	**122**	**12.3**	**56.0**	**291**	**221**	**170**	**371**	**37.6**	**68.8**	NA	**26.7**	**18.4**
Total CVOCs - Chloroethane		NA	**273**	NA	**111**	**10.9**	**32**	**41**	**30.7**	ND	**101**	**37.6**	**1.8**	NA	**0.72**	**0.41**
Total VOCs		NA	**290**	NA	**377**	**83.2**	**1,595**	**1,662**	**1,389**	**267**	**465**	**46.8**	**77.2**	NA	**26.7**	**18.4**
	Dissolved Gases (µg/L)															
74-84-0	**Ethane**	NA	7.5 U	NS	NS	NS	NS	380 U	380 U	NS	NS	7.5 U	NS	NS	NS	NS
74-85-1	**Ethene**	NA	7.0 U	NS	NS	NS	NS	350 U	350 U	NS	NS	7.0 U	NS	NS	NS	NS
74-82-8	**Methane**	NA	**90.0**	NS	NS	NS	NS	**4,100 D**	**7,000**	NS	NS	**29.0**	NS	NS	NS	NS
	General Chemistry (mg/L)															
14808-79-8	**Sulfate**	250,000	**23.1**	NS	**0.57 J**	**51.4**	NS	NS	NS	NS	NS	**36.0**	NS	NS	NS	NS
NA	**Total Organic Carbon**	NA	**0.96 J**	**3,330**	**303 D**	**54.1**	**268**	**86.0 D**	**4.60 B**	**38.8**	**94.9 D**	1.0 U	NS	NS	NS	NS
	Metals (µg/L)															
7440-38-2	**Arsenic**	25	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-89-6	**Iron**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-96-5	**Manganese**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Biological Analyses (cells/mL)															
NA	**Dehalococcoides (Dhc)**	NA	**9.00E+03**	NS	NS	NS	NS	1.00E+04 U	**9.00E+06**	NS	NS	1.00E+03 U	NS	NS	NS	NS
NA	**Dehalobacter (Dhb)**	NA	2.00E+03 U	NS	NS	NS	NS	**5.00E+03 J**	**4.00E+05**	NS	NS	1.00E+03 J	NS	NS	NS	NS
NA	**tceA Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	**BAV1 VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	**VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Water Quality Parameters															
NA	**pH**	NA	**7.40**	NS	**6.19**	**6.96**	**7.21**	**6.43**	**6.25**	**6.50**	**6.40**	**7.76**	**6.38**	NS	**6.82**	**7.02**
NA	**ORP (mV)**	NA	**10.0**	NS	**-13.0**	**-77.0**	**-42.0**	**-89.1**	**-63.4**	**-300.3**	**-170.0**	**-16.5**	**-69.5**	NS	**-87.3**	**-92.0**
NA	**Dissolved Oxygen (mg/L)**	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - Not Applicable
NS - Not Sampled
U/ND - The compoud was not detected at a concentration greater than or equal to the MDL.
CVOC - Chlorinated Volatile Organic Compound
J - The concentration given is an approximate value. The concentration is less than the reporting limit (RL) and greater than or equal to the MDL.
D - The reported value is from a secondary dilution analysis factor.
E - The compound concentration exceeded the calibration range.
F1 - MS and/or MSD recovery is outside accepted limits
* Laboratory control sample (LCS) or LCS Duplicate (LCSD) exceeds the control limits.
B - Compound was found in the blank and sample.
H - Sample was prepped or analyzed beyond the specified holding time
^ - Instrument related QC is outside acceptance limit
MS-09 - Matrix spike recovery and/or matri spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.
V-05 - Continuing calibration did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
V-34 - Initial calibration verification (ICV) id not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
L-04 - Laboratory fortified blank/laboratory control sample recovery and duplicate recovery are outside of control limits. Reported value for this compound is likely to be biased on the low side.
MS-07A - Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery. Possiblity of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.

Table 2-4
Groundwater Analytical Results, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Well ID		AWQS/GV	MHC-22								
Date			2/8/2011	11/4/2013	1/18/2014	4/17/2014	7/16/2014	12/29/2014	4/23/2015	10/8/2015	10/19/2016
CAS No.	*VOC (µg/L)*										
71-55-6	1,1,1-Trichloroethane	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
75-34-3	1,1-Dichloroethane	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	**1.1**	**0.67 J**	1.0 U	1.0 U
107-06-2	1,2-Dichloroethane	0.6	1.0 U	NS	5.0 U	5.0 U	5.0 U	**0.37 J**	1.00 U	**0.41 J**	1.0 U
75-00-3	Chloroethane	5	1.0 U	NS	5.0 U	5.0 U	**2.9 DJ**	**4.3**	**1.1**	**0.36 J**	1.0 U
75-35-4	1,1-Dichloroethene	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	**0.60 J**	1.0 U	1.0 U
127-18-4	Tetrachloroethene	5	**22.0**	NS	5.0 U	**7.3 D**	5.0 U	1.0 U	**25**	1.0 U	1.0 U
79-01-6	Trichloroethene	5	**92.0**	NS	5.0 U	**380 D**	5.0 U	**0.47 J**	**52**	1.0 U	1.0 U
156-59-2	cis-1,2-Dichloroethene	5	**130 D**	NS	**16.0 D**	**390 D**	5.0 U	**4.5**	**380 D**	**3.2**	**4.2**
75-01-4	Vinyl chloride	2	**27.0**	NS	**12.0 D**	**70.0 D**	5.0 U	**2.0**	**51**	**9.1**	**14.0**
78-93-3	2-Butanone	50(GV)	10.0 U	NS	**55.0 D**	50.0 U	**15.0 DJ**	10.0 U	10.0 U	10 U	10 U
67-64-1	Acetone	50 (GV)	10.0 U	NS	**140 D**	**24.0 DJ**	**70.0 D**	**3.6 J**	**13**	10 U	10 U
108-87-2	Methylcyclohexane	50	1.0 U	NS	5.0 U	5.0 U	5.0 U	**0.9 J**	**1.7**	1.0 U	1.0 U
79-34-5	1,1,2,2-Tetrachloroethane	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
79-00-5	1,1,2-Trichloroethane	1	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluroethane	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
120-82-1	1,2,4-Trichlorobenzene	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
96-12-8	1,2-Dibromo-3-chloropropane	0.04	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
106-93-4	1,2-Dibromoethane	NA	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
95-50-1	1,2-Dichlorobenzene	3	1.0 U	NS	5.0 U	5.0 U	5.0 U	**2.5**	**0.94 J**	**2.8**	**2.1**
78-87-5	1,2-Dichloropropane	1	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
541-73-1	1,3-Dichlorobenzene	3	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
106-46-7	1,4-Dichlorobenzene	3	1.0 U	NS	5.0 U	5.0 U	5.0 U	**1.0**	1.0 U	1.0 U	1.0 U
594-20-7	2-Hexanone	50	5.0 U	NS	25.0 U	25.0 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U
108-10-1	4-Methyl-2-pentanone	NA	5.0 U	NS	25.0 U	25.0 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U
71-43-2	Benzene	1	**3.9**	NS	**11.0 D**	**3.8 DJ**	**12.0 D**	**12**	**1.7**	**12**	**8.5**
75-27-4	Bromodichloromethane	50(GV)	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
75-25-2	Bromoform	50(GV)	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
74-83-9	Bromomethane	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
75-15-0	Carbon disulfide	NA	1.0 U	NS	5.0 U	5.0 U	5.0 U	**0.23 J**	1.0 U	1.0 U	1.0 U
56-23-5	Carbon tetrachloride	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
108-90-7	Chlorobenzene	5	**1.4**	NS	5.0 U	5.0 U	**4.9 DJ**	**3.8**	**1.0**	**4.8**	**4.3**
67-66-3	Chloroform	7	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
74-87-3	Chloromethane	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
10061-01-5	cis-1,3-Dichloropropene	0.4	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
10061-02-6	trans-1,3-Dichloropropene		1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
110-82-7	Cyclohexane	NA	1.0 U	NS	5.0 U	5.0 U	5.0 U	**0.47 J**	**1.7**	1.0 U	1.0 U
124-48-1	Dibromochloromethane	50(GV)	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
75-71-8	Dichlorodifluoromethane	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
100-41-4	Ethylbenzene	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
98-82-8	Isopropylbenzene	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
79-20-9	Methyl acetate	NA	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1634-04-4	Methyl tert-butyl ether	10(GV)	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
75-09-2	Methylene chloride	5	1.0 U	NS	5.0 U	5.0 U	**2.5 DJ**	**1 U**	1.0 U	1.0 U	1.0 U
100-42-5	Styrene	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
108-88-3	Toluene	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	**2.1**	**0.62 J**	**1.4**	**3.3**
156-60-5	trans-1,2-Dichloroethene	5	**1.2**	NS	5.0 U	5.0 U	5.0 U	**1.1**	**2.7**	**1.0**	**1.7**
75-69-4	Trichlorofluoromethane	5	1.0 U	NS	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1330-20-7	Xylenes, Total	100	2.0 U	NS	10.0 U	10.0 U	10.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Total CVOCs		NA	**274**	NA	**28.0**	**847**	**10.3**	**21.1**	**515**	**21.7**	**26.3**
Total CVOCs - Chloroethane		NA	**274**	NA	**28**	**847**	**7**	**17**	**514**	**21.3**	**26.3**
Total VOCs		NA	**278**	NA	**234**	**875**	**107**	**40**	**534**	**35.1**	**38.1**
	Dissolved Gases (µg/L)										
74-84-0	Ethane	NA	NS	NS	NS	NS	NS	**100**	380 U	NS	NS
74-85-1	Ethene	NA	NS	NS	NS	NS	NS	**18**	350 U	NS	NS
74-82-8	Methane	NA	NS	NS	NS	NS	NS	**3,300 D**	**10,000 D**	NS	NS
	General Chemistry (mg/L)										
14808-79-8	Sulfate	250,000	NS	NS	20.0 U	**0.40 J**	NS	NS	NS	NS	NS
NA	Total Organic Carbon	NA	NS	**424**	**255 D**	**58.7**	**107**	**15.2 D**	**12.6 B**	**9.5 B**	**11.8**
	Metals (µg/L)										
7440-38-2	Arsenic	25	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-89-6	Iron	300	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-96-5	Manganese	300	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Biological Analyses (cells/mL)										
NA	Dehalococcoides (Dhc)	NA	NS	NS	NS	NS	NS	**3.00E+06**	**5.00E+06**	NS	NS
NA	Dehalobacter (Dhb)	NA	NS	NS	NS	NS	NS	**3.00E+05**	**1.00E+05**	NS	NS
NA	tceA Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	BAV1 VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	VC Reductase	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Water Quality Parameters										
NA	pH	NA	**7.49**	NS	**6.84**	**6.59**	**6.90**	**6.48**	**6.64**	**6.56**	**6.64**
NA	ORP (mV)	NA	**-90.0**	NS	**-28.0**	**-106**	**-133**	**-91.5**	**-110.0**	**-140.0**	**-102.0**
NA	Dissolved Oxygen (mg/L)	NA	--	--	--	--	--	--	--	--	--

Well ID		MHC-23											
Date		11/26/2012	11/4/2013	1/18/2014	4/17/2014	7/16/2014	12/29/2014	4/23/2015	10/7/2015	10/19/2016	5/23/2018	6/5/2019	11/3/2021
CAS No.	*VOC (µg/L)*												
71-55-6	1,1,1-Trichloroethane	**3,900 D**	NS	**140 D**	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	**110 D**	130 U
75-34-3	1,1-Dichloroethane	**590 D**	NS	**10,000 D**	**640 D**	**1,100 D**	**150 DJ**	**290 D**	250 U	80 U	**1,700 D**	**260 D**	**130**
107-06-2	1,2-Dichloroethane	**35.0**	NS	**920 D**	**470 D**	**96.0 DJ**	250 U	**65 DJ**	250 U	80 U	50 U, D	25 U, D	130 U
75-00-3	Chloroethane	**220 D**	NS	**18,000 D**	**15,000 D**	**13,000 D**	**11,000 D**	**10,000 D**	**5,700 D**	**3,500 D**	**6,600 D**	**2,400 D**	**4,500**
75-35-4	1,1-Dichloroethene	**530 D**	NS	**19.0 DJ**	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
127-18-4	Tetrachloroethene	**23.0**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
79-01-6	Trichloroethene	**340 D**	NS	**31.0 DJ**	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
156-59-2	cis-1,2-Dichloroethene	**490 D**	NS	**140 D**	250 U	**1,300 D**	**340 D**	**460**	250 U	80 U	**190 D**	25 U, D	130 U
75-01-4	Vinyl chloride	**20.0**	NS	**52.0 D**	250 U	250 U	250 U	250 U	250 U	80 U	**260 D**	50 U, D	130 U
78-93-3	2-Butanone	10.0 U	NS	**180 DJ**	**600 DJ**	**650 DJ**	2,500 U	**580 DJ**	2,500 U	800 U	1,000 U, D	500 U, D	1,300 U
67-64-1	Acetone	**7.2 J**	NS	**200 DJ**	2,500 U	2,500 U	2,500 U	2500 U	2,500 U	800 U	2,500 U, D	1,200 U, D	1,300 U
108-87-2	Methylcyclohexane	**250 D**	NS	**86.0 D**	**67 DJ**	**77 DJ**	**100 DJ**	**67 DJ**	250 U	**28 DJ**	50 U, D	25 U, D	130 U
79-34-5	1,1,2,2-Tetrachloroethane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	25 U, D	12 U, D	130 U
79-00-5	1,1,2-Trichloroethane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluroethane	**77.0**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
120-82-1	1,2,4-Trichlorobenzene	**0.80 J**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
96-12-8	1,2-Dibromo-3-chloropropane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	250 U, D	120 U, D	130 U
106-93-4	1,2-Dibromoethane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	25 U, D	12 U, D	130 U
95-50-1	1,2-Dichlorobenzene	**260 D**	NS	**74.0 D**	250 U	250 U	250 U	250 U	250 U	**72 DJ**	**100 D**	**62 D**	130 U
78-87-5	1,2-Dichloropropane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
541-73-1	1,3-Dichlorobenzene	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
106-46-7	1,4-Dichlorobenzene	**26**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
594-20-7	2-Hexanone	5.0 U	NS	250 U	1,300 U	1,300 U	1,300 U	1,300 U	1,300 U	400 U	500 U, D	250 U, D	630 U
108-10-1	4-Methyl-2-pentanone	5.0 U	NS	250 U	1,300 U	1,300 U	1,300 U	1,300 U	1,300 U	400 U	500 U, D	250 U, D	630 U
71-43-2	Benzene	**1.4**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
75-27-4	Bromodichloromethane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	25 U, D	12 U, D	130 U
75-25-2	Bromoform	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
74-83-9	Bromomethane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	100 U, D, V-05	50 U, D	130 U
75-15-0	Carbon disulfide	**0.46 J**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	200 U, D	120 U, D	130 U
56-23-5	Carbon tetrachloride	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	250 U, D	120 U, D	130 U
108-90-7	Chlorobenzene	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
67-66-3	Chloroform	**2.1**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	100 U, D	50 U, D	130 U
74-87-3	Chloromethane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	100 U, D	50 U, D	130 U
10061-01-5	cis-1,3-Dichloropropene	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	25 U, D	12 U, D	130 U
10061-02-6	trans-1,3-Dichloropropene	1.0 U	NS	50.0 U	250 U	250 U	250	250 U	250 U	80 U	25 U, D	12 U, D	130 U
110-82-7	Cyclohexane	**81.0**	NS	**36.0 DJ**	250 U	250 U	250 U	250 U	250 U	80 U	NS	NS	130 U
124-48-1	Dibromochloromethane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	NS	NS	130 U
75-71-8	Dichlorodifluoromethane	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	100 U, D	50 U, D	130 U
100-41-4	Ethylbenzene	**4.7**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
98-82-8	Isopropylbenzene	**3.7**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
79-20-9	Methyl acetate	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	310 U
1634-04-4	Methyl tert-butyl ether	1.0 U	NS	**49.0 DJ**	250 U	250 U	250 U	250 U	250 U	**16 DJ**	50 U, D	25 U, D	130 U
75-09-2	Methylene chloride	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	250 U, D	120 U, D	130 U
100-42-5	Styrene	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
108-88-3	Toluene	**4.1**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	**100 D**	25 U, D	130 U
156-60-5	trans-1,2-Dichloroethene	1.0 U	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	50 U, D	25 U, D	130 U
75-69-4	Trichlorofluoromethane	**2.1**	NS	50.0 U	250 U	250 U	250 U	250 U	250 U	80 U	100 U, D	50 U, D	130 U
1330-20-7	Xylenes, Total	**7.8**	NS	100 U	500 U	500 U	500 U	500 U	500 U	160 U	50 U, D	25 U, D	250 U
Total CVOCs		**6,516**	NA	**29,376**	**16,110**	**15,496**	**11,740**	**10,815**	**5,700**	**3,572**	**8,850**	**2,832**	**4,630**
Total CVOCs - Chloroethane		**6,296**	NA	**11,376**	**1,110**	**2,496**	**740**	**815**	ND	**72.0**	**2,250.0**	**432.0**	**130.0**
Total VOCs		**6,876**	NA	**29,927**	**16,777**	**16,223**	**11,840**	**11,462**	**5,700**	**3,616**	**8,950**	**2,832**	**4,630**
	Dissolved Gases (µg/L)												
74-84-0	Ethane	380 U	NS	NS	**35.0 DJ**	**95.0 D**	750 U	750 U	750 U	750 U	**510**	**270**	**200**
74-85-1	Ethene	350 U	NS	NS	**82.0 DJ**	**82.0 D**	700 U	700 U	700 U	700 U	**45**	**16 J**	17 U
74-82-8	Methane	**400**	NS	NS	**2,700 D**	**3,200 D**	**4,300 D**	**14,000 D**	**11,000 D**	**3,100 D**	**1,600 D**	**18,000**	**11,000**
	General Chemistry (mg/L)												
14808-79-8	Sulfate	**3.4**	NS	**9.9 D**	**1.0 J**	NS	NS	NS	NS	NS	0.92 U	**1.9**	1.5 U
NA	Total Organic Carbon	**3.8**	**249**	**277 D**	**338 D**	**370 D**	**358 D**	**344 DB**	**64.6 D**	**14.1**	**24**	**16 W-18, Z-01**	**7.2**
	Metals (µg/L)												
7440-38-2	Arsenic	NS	NS	**9.3 J**	NS	NS	**11**	**10 J**	**21**	**25**	NS	NS	NS
7439-89-6	Iron	NS	NS	**85,000**	NS	NS	**111,000**	**102,000**	**78,800**	**36,100**	NS	NS	NS
7439-96-5	Manganese	NS	NS	**9,100**	NS	NS	**10,900 B**	**9,500**	**7,900**	**4,700**	NS	NS	NS
	Biological Analyses (cells/mL)												
NA	Dehalococcoides (Dhc)	**7.00E+05**	NS	NS	NS	**1.00E+06**	**3.00E+05**	**5.00E+05**	**1.38E+07**	**1.90E+09**	**3.18E+02**	**7.80E+03**	**3.94E+04**
NA	Dehalobacter (Dhb)	**4.00E+06**	NS	NS	NS	**1.00E+07**	**2.00E+06**	**3.00E+06**	**4.62E+05**	**1.17E+08**	**7.00E+03**	**1.28E+04**	**2.73E+04**
NA	tceA Reductase	NS	NS	NS	NS	NS	NS	NS	NS	NS	**1.49E+01**	**4.36E+02**	**1.57E+02**
NA	BAV1 VC Reductase	NS	NS	NS	NS	NS	NS	NS	NS	NS	**1.03E+01**	**7.56E+01**	**2.58E+01**
NA	VC Reductase	NS	NS	NS	NS	NS	NS	NS	NS	NS	**4.24E+01**	**4.27E+02**	**7.18E+02**
	Water Quality Parameters												
NA	pH	**7.06**	NS	**6.27**	**6.42**	**6.27**	**5.97**	**6.01**	**6.34**	**6.56**	**6.82**	**6.65**	**6.28**
NA	ORP (mV)	**-8.7**	NS	**-30.0**	**-39.0**	**-101**	**-55.9**	**-53.0**	**-117.7**	**-104.0**	**-62.9**	**-105.1**	**-49.9**
NA	Dissolved Oxygen (mg/L)	--	--	--	--	--	--	--	--	--	**0.97**	**0.00**	**0.19**

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - Not Applicable
NS - Not Sampled
U/ND - The compoud was not detected at a concentration greater than or equal to the MDL.
CVOC - Chlorinated Volatile Organic Compound
J - The concentration given is an approximate value. The concentration is less than the reporting limit (RL) and greater than or equal to the MDL.
D - The reported value is from a secondary dilution analysis factor.
E - The compound concentration exceeded the calibration range.
F1 - MS and/or MSD recovery is outside accepted limits
* Laboratory control sample (LCS) or LCS Duplicate (LCSD) exceeds the control limits.
B - Compound was found in the blank and sample.
H - Sample was prepped or analyzed beyond the specified holding time
^ - Instrument related QC is outside acceptance limit
MS-09 - Matrix spike recovery and/or matri spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.
V-05 - Continuing calibration did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
V-34 - Initial calibration verification (ICV) id not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
L-04 - Laboratory fortified blank/laboratory control sample recovery and duplicate recovery are outside of control limits. Reported value for this compound is likely to be biased on the low side.
MS-07A - Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery. Possiblity of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.

Table 2-4
Groundwater Analytical Results, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Well ID		AWQS/GV	MHC-24					MHC-25S						
Date			2/8/2011	12/30/2014	4/23/2015	10/7/2015	10/19/2016	11/29/2012	12/30/2014	4/23/2015	10/8/2015	10/19/2016	6/5/2019	11/3/2021
CAS No.	*VOC (µg/L)*													
71-55-6	**1,1,1-Trichloroethane**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	**3.9**	1.0 U	1.0 U	1.0 U
75-34-3	**1,1-Dichloroethane**	5	**1.5**	1.0 U	NS	1.0 U	**2.6**	**3.6**	**2.4**	NS	**3.6**	**0.74 J**	**1.0**	**1.9**
107-06-2	**1,2-Dichloroethane**	0.6	1.0 U	**0.39 J**	NS	**0.65 J**	**0.95 J**	**2.8**	**1.0**	NS	**2.0**	1.0 U	1.0 U	**2.1**
75-00-3	**Chloroethane**	5	1.0 U	**5.9**	NS	**2.6**	**11**	1.0 U	**2.7**	NS	1.0 U	**1.0**	**4.3**	**1.1**
75-35-4	**1,1-Dichloroethene**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
127-18-4	**Tetrachloroethene**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
79-01-6	**Trichloroethene**	5	**2.4**	**1.2**	NS	**0.68 J**	**0.52 J**	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
156-59-2	**cis-1,2-Dichloroethene**	5	**9.4**	**1.8**	NS	**1.6**	**1.9**	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
75-01-4	**Vinyl chloride**	2	**17.0**	**2.0**	NS	**1.3**	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	2.0 U	1.0 U
78-93-3	**2-Butanone**	50(GV)	10.0 U	10.0 U	NS	10 U	10 U	10 U	10 U	NS	10 U	10 U	20 U	10 U
67-64-1	**Acetone**	50 (GV)	10.0 U	10.0 U	NS	10 U	**8.3 J**	**8.4 J**	10 U	NS	10 U	**3.8 J**	50 U	10 U
108-87-2	**Methylcyclohexane**	50	**0.95 J**	**1.3**	NS	1.0 U	**0.63 J**	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
79-34-5	**1,1,2,2-Tetrachloroethane**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	0.50 U	1.0 U
79-00-5	**1,1,2-Trichloroethane**	1	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
76-13-1	**1,1,2-Trichloro-1,2,2-trifluroethane**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
120-82-1	**1,2,4-Trichlorobenzene**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
96-12-8	**1,2-Dibromo-3-chloropropane**	0.04	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	5.0 U	1.0 U
106-93-4	**1,2-Dibromoethane**	NA	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	0.50 U	1.0 U
95-50-1	**1,2-Dichlorobenzene**	3	1.0 U	**1.2**	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
78-87-5	**1,2-Dichloropropane**	1	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
541-73-1	**1,3-Dichlorobenzene**	3	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
106-46-7	**1,4-Dichlorobenzene**	3	1.0 U	**1.8**	NS	**0.91 J**	**1.1**	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
594-20-7	**2-Hexanone**	50	5.0 U	5.0 U	NS	5.0 U	1.0 U	5.0 U	5.0 U	NS	5.0 U	5.0 U	10 U	5.0 U
108-10-1	**4-Methyl-2-pentanone**	NA	5.0 U	5.0 U	NS	5.0 U	**2.3 J**	5.0 U	5.0 U	NS	5.0 U	5.0 U	10 U	5.0 U
71-43-2	**Benzene**	1	**0.98 J**	**2.2**	NS	**3.8**	**17**	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
75-27-4	**Bromodichloromethane**	50(GV)	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	0.50 U	1.0 U
75-25-2	**Bromoform**	50(GV)	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
74-83-9	**Bromomethane**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	2.0 U	1.0 U
75-15-0	**Carbon disulfide**	NA	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	5.0 U	1.0 U
56-23-5	**Carbon tetrachloride**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	5.0 U	1.0 U
108-90-7	**Chlorobenzene**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
67-66-3	**Chloroform**	7	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	2.0 U	1.0 U
74-87-3	**Chloromethane**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	2.0 U	1.0 U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	0.50 U	1.0 U
10061-02-6	**trans-1,3-Dichloropropene**		1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	0.50 U	1.0 U
110-82-7	**Cyclohexane**	NA	1.0 U	**0.55 J**	NS	1.0 U	**1.4**	1.0 U	1.0 U	NS	1.0 U	1.0 U	NS	1.0 U
124-48-1	**Dibromochloromethane**	50(GV)	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	NS	1.0 U
75-71-8	**Dichlorodifluoromethane**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	2.0 U	1.0 U
100-41-4	**Ethylbenzene**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
98-82-8	**Isopropylbenzene**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
79-20-9	**Methyl acetate**	NA	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	2.5 U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	1.0 U	1.0 U	NS	1.0 U	1.0 U	**1.6**	**0.97 J**	NS	1.0 U	1.0 U	**1.0**	**1.2**
75-09-2	**Methylene chloride**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	5.0 U	1.0 U
100-42-5	**Styrene**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
108-88-3	**Toluene**	5	1.0 U	1.0 U	NS	1.0 U	**1.8**	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
156-60-5	**trans-1,2-Dichloroethene**	5	1.0 U	**1.4**	NS	**2.7**	**3.7**	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U
75-69-4	**Trichlorofluoromethane**	5	1.0 U	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U	1.0 U	2.0 U	1.0 U
1330-20-7	**Xylenes, Total**	100	2.0 U	2.0 U	NS	2.0 U	2.0 U	2.0 U	2.0 U	NS	2.0 U	2.0 U	1.0 U	2.0 U
Total CVOCs		NA	**30.3**	**15.7**	NA	**10.4**	**21.8**	**6.4**	**6.1**	NA	**9.5**	**1.7**	**5.3**	**5.1**
Total CVOCs - Chloroethane		NA	**30.3**	**9.8**	NA	**7.8**	**10.8**	**6.4**	**3.4**	NA	**9.5**	**0.74**	**1.00**	**4.00**
Total VOCs		NA	**32.2**	**19.7**	NA	**14.2**	**53.2**	**16.4**	**7.1**	NA	**9.5**	**5.5**	**6.3**	**6.3**
	Dissolved Gases (µg/L)													
74-84-0	**Ethane**	NA	NS	NS	NS	NS	NS	7.5 U	NS	NS	NS	NS	7.8 U	**4.5 J**
74-85-1	**Ethene**	NA	NS	NS	NS	NS	NS	7.0 U	NS	NS	NS	NS	9.2 U	1.5 U
74-82-8	**Methane**	NA	NS	NS	NS	NS	NS	**13.0**	NS	NS	NS	NS	**440**	**750**
	General Chemistry (mg/L)													
14808-79-8	**Sulfate**	250,000	NS	NS	NS	NS	NS	**17.2**	NS	NS	NS	NS	**100**	**1.7 J**
NA	**Total Organic Carbon**	NA	NS	NS	NS	NS	NS	**0.47 J**	NS	NS	NS	NS	**5.9 W-18**	**3.5**
	Metals (µg/L)													
7440-38-2	**Arsenic**	25	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-89-6	**Iron**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7439-96-5	**Manganese**	300	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Biological Analyses (cells/mL)													
NA	**Dehalococcoides (Dhc)**	NA	NS	NS	NS	NS	NS	**5.00E+04**	NS	NS	NS	NS	NS	NS
NA	**Dehalobacter (Dhb)**	NA	NS	NS	NS	NS	NS	1.00E+04 U	NS	NS	NS	NS	NS	NS
NA	**tceA Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	**BAV1 VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NA	**VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Water Quality Parameters													
NA	**pH**	NA	**7.43**	**6.70**	NS	**6.95**	**6.78**	**7.42**	**6.88**	NS	**7.41**	**7.15**	**7.11**	**7.05**
NA	**ORP (mV)**	NA	**-110**	**-91.9**	NS	**-118.4**	**-107.0**	**-10.2**	**-30**	NS	**-24.0**	**-112.0**	**-299.5**	**-125.9**
NA	**Dissolved Oxygen (mg/L)**	NA	--	--	--	--	--	--	--	--	--	--	**0.09**	**0.18**

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
µg/L - micrograms per liter
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CVOC - Chlorinated Volatile Organic Compound
J - The concentration given is an approximate value. The concentration is less than the reporting limit (RL) and greater than or equal to the MDL.
D - The reported value is from a secondary dilution analysis factor.
E - The compound concentration exceeded the calibration range.
F1 - MS and/or MSD recovery is outside accepted limits
* Laboratory control sample (LCS) or LCS Duplicate (LCSD) exceeds the control limits.
B - Compound was found in the blank and sample.
H - Sample was prepped or analyzed beyond the specified holding time
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MS-09 - Matrix spike recovery and/or matri spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.
V-05 - Continuing calibration did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
V-34 - Initial calibration verification (ICV) id not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
L-04 - Laboratory fortified blank/laboratory control sample recovery and duplicate recovery are outside of control limits. Reported value for this compound is likely to be biased on the low side.
MS-07A - Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery. Possiblity of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.

Table 2-4
Groundwater Analytical Results, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Well ID			MHC-26												
	Date	AWQS/GV	3/21/2011	12/11/2012	11/4/2013	1/18/14	4/17/2014	7/16/2014	12/29/2014	4/23/2015	10/7/2015	10/19/2016	5/23/2018	6/4/2019	11/2/2021
CAS No.	*VOC (µg/L)*														
71-55-6	**1,1,1-Trichloroethane**	5	**360 D**	**1,500 D**	NS	**24.0 D**	**17.0 D**	40 U	**60 D**	**19 DF1^**	**40 D**	80 U	**46 D**	100 U, D	130 U
75-34-3	**1,1-Dichloroethane**	5	**89.0 D**	**1,100 D**	NS	**280 D**	**150 D**	**720 D**	**1,400 D**	**150 D**	**250 D**	80 U	**420 D**	**100 D**	**58 J**
107-06-2	**1,2-Dichloroethane**	0.6	5.0 U	**27.0 D**	NS	**20.0 D**	**7.8 D**	**73.0 D**	**150 D**	**11 D**	**90 D**	80 U	40 U, D	100 U, D	130 U
75-00-3	**Chloroethane**	5	**33.0 D**	**860 D**	NS	**670 D**	**200 D**	**2,700 D**	**3,500 D**	**400 D**	**4,400 D**	**2,300 D**	**3,400 D**	**6,600 D**	**6,200**
75-35-4	**1,1-Dichloroethene**	5	**38.0 D**	**280 D**	NS	**6.7 D**	**5.1 D**	40 U	**20 DJ**	10 U	10 U	80 U	40 U, D	100 U, D	130 U
127-18-4	**Tetrachloroethene**	5	**4.6 DJ**	25.0 U	NS	**12.0 D**	**13.0 D**	40 U	40 U	**9.3 DJ**	10 U	80 U	40 U, D	100 U, D	130 U
79-01-6	**Trichloroethene**	5	**7.2 D**	**28.0 D**	NS	**11.0 D**	**15.0 D**	40 U	**65 D**	**20 D**	10 U	80 U	40 U, D	100 U, D	130 U
156-59-2	**cis-1,2-Dichloroethene**	5	**57.0 D**	**190 D**	NS	**16.0 D**	**16.0 D**	40 U	**210 D**	**15 D**	**8.4 DJ**	80 U	40 U, D	100 U, D	130 U
75-01-4	**Vinyl chloride**	2	**5.2 D**	**190 D**	NS	**110 D**	**61.0 D**	**53.0 D**	**810 D**	**49 D**	**28 D**	80 U	80 U, D	200 U, D	130 U
78-93-3	**2-Butanone**	50(GV)	50.0 U	250 U	NS	100 U	50.0 U	**430 D**	400 U	100 U	**93 DJ**	800 U	800 U, D	2,000 U, D	1,300 U
67-64-1	**Acetone**	50 (GV)	50.0 U	250 U	NS	**51.0 DJ**	**16.0 DJ**	**690 D**	**200 DJ**	**36 DJ**	**300 D**	800 U	2000 U, D	5,000 U, D	1,300 U
108-87-2	**Methylcyclohexane**	50	5.0 U	**26.0 D**	NS	**40.0 D**	**20.0 D**	**51.0 D**	**40 D**	**31 D**	**18 D**	80 U	40 U, D	100 U, D	**20 J**
79-34-5	**1,1,2,2-Tetrachloroethane**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	20 U, D	50 U, D	130 U
79-00-5	**1,1,2-Trichloroethane**	1	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	130 U
76-13-1	**1,1,2-Trichloro-1,2,2-trifluroethane**	5	5.0 U	25.0 U	NS	**26.0 D**	**15.0 D**	40 U	**26 DJ**	**19 D**	10 U	80 U	40 U, D	100 U, D	130 U
120-82-1	**1,2,4-Trichlorobenzene**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	130 U
96-12-8	**1,2-Dibromo-3-chloropropane**	0.04	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	200 U, D	500 U, D	130 U
106-93-4	**1,2-Dibromoethane**	NA	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	20 U, D	50 U, D	130 U
95-50-1	**1,2-Dichlorobenzene**	3	5.0 U	**30.0 D**	NS	10.0 U	5.0 U	40 U	40 U	10 U	**8.2 DJ**	80 U	40 U, D	100 U, D	130 U
78-87-5	**1,2-Dichloropropane**	1	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	130 U
541-73-1	**1,3-Dichlorobenzene**	3	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	130 U
106-46-7	**1,4-Dichlorobenzene**	3	5.0 U	25.0 U	NS	**8.7 DJ**	**18.0 D**	**35.0 DJ**	**45 D**	**38 D**	**60 D**	80 U	**76 D**	100 U, D	130 U
594-20-7	**2-Hexanone**	50	25.0 U	125 U	NS	50.0 U	25.0 U	200 U	200 U	50 U	10 U	400 U	400 U, D	1,000 U, D	630 U
108-10-1	**4-Methyl-2-pentanone**	NA	25.0 U	125 U	NS	50.0 U	25.0 U	200 U	**85 DJ**	50 U	**43 DJ**	400 U	400 U, D	1,000 U, D	630 U
71-43-2	**Benzene**	1	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	**64 D**	**4.3 DJ**	**29 D**	80 U	40 U, D	100 U, D	130 U
75-27-4	**Bromodichloromethane**	50(GV)	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	20 U, D	50 U, D	130 U
75-25-2	**Bromoform**	50(GV)	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	130 U
74-83-9	**Bromomethane**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	80 U, D, V-05	200 U, D	130 U
75-15-0	**Carbon disulfide**	NA	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	160 U, D	500 U, D	130 U
56-23-5	**Carbon tetrachloride**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	200 U, D	500 U, D	130 U
108-90-7	**Chlorobenzene**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	130 U
67-66-3	**Chloroform**	7	5.0 U	25.0 U	NS	**3.5 DJ**	5.0 U	40 U	40 U	10 U	10 U	80 U	80 U, D	200 U, D	130 U
74-87-3	**Chloromethane**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	80 U, D	200 U, D	130 U
10061-01-5	**cis-1,3-Dichloropropene**	0.4	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	20 U, D	50 U, D	130 U
10061-02-6	**trans-1,3-Dichloropropene**		5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	20 U, D	50 U, D	130 U
110-82-7	**Cyclohexane**	NA	5.0 U	25.0 U	NS	**37 D**	**18 D**	**45 D**	**43 D**	**24 D**	**19 D**	80 U	NS	NS	130 U
124-48-1	**Dibromochloromethane**	50(GV)	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	NS	NS	130 U
75-71-8	**Dichlorodifluoromethane**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	80 U, D	200 U, D	130 U
100-41-4	**Ethylbenzene**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	130 U
98-82-8	**Isopropylbenzene**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	130 U
79-20-9	**Methyl acetate**	NA	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	310 U
1634-04-4	**Methyl tert-butyl ether**	10(GV)	5.0 U	**23.0 DJ**	NS	10.0 U	5.0 U	40 U	**9.1 DJ**	10 U	**9.8 DJ**	80 U	40 U, D	100 U, D	130 U
75-09-2	**Methylene chloride**	5	**2.9 DJ**	**12.0 DJ**	NS	10.0 U	**6.5 D**	**56.0 D**	**180 D**	10 U	**100 D**	80 U	200 U, D	500 U, D	130 U
100-42-5	**Styrene**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	40 U, D	100 U, D	130 U
108-88-3	**Toluene**	5	5.0 U	25.0 U	NS	10.0 U	**4.8 J**	**29.0 DJ**	**120 D**	**12 D**	**67 D**	80 U	40 U, D	100 U, D	130 U
156-60-5	**trans-1,2-Dichloroethene**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	**44 D**	10 U	**17 D**	80 U	40 U, D	100 U, D	130 U
75-69-4	**Trichlorofluoromethane**	5	5.0 U	25.0 U	NS	10.0 U	5.0 U	40 U	40 U	10 U	10 U	80 U	80 U, D	200 U, D	130 U
1330-20-7	**Xylenes, Total**	100	10.0 U	50.0 U	NS	20.0 U	10.0 U	80 U	**31 DJ**	20 U	**21 D**	160 U	40 U, D	100 U, D	250 U
Total CVOCs		NA	**597**	**4,217**	NA	**1,188**	**524**	**3,637**	**6,510**	**730**	**5,002**	**2,300**	**3,942**	**6,700**	**6,258**
Total CVOCs - Chloroethane		NA	**564**	**3,357**	NA	**518**	**324**	**937**	**3,010**	**330**	**602**	ND	**542**	**100**	**58**
Total VOCs		NA	**597**	**4,266**	NA	**1,316**	**583**	**4,882**	**7,102**	**838**	**5,601**	**2,300**	**3,942**	**6,700**	**6,278**
	Dissolved Gases (µg/L)														
74-84-0	**Ethane**	NA	NS	NS	NS	NS	150 U	**27.0 DJ**	750 U	750 U	NS	750 D	**290**	**300**	**260 J**
74-85-1	**Ethene**	NA	NS	NS	NS	NS	140 U	70.0 U	700 U	700 U	NS	700 D	**21**	**21**	66 U
74-82-8	**Methane**	NA	NS	NS	NS	NS	**1,700 D**	**2,600 D**	**2,100 D**	**7,200 D**	**7,800 D**	**4,100 D**	**16,000 D**	**15,000**	**14,000**
	General Chemistry (mg/L)														
14808-79-8	**Sulfate**	250,000	NS	NS	NS	**35.6 D**	**1.7 J**	NS	NS	NS	NS	NS	0.92 U	**2.2**	1.50 U
NA	**Total Organic Carbon**	NA	NS	**6.4**	**3,140**	**39.0**	**38.0**	**458**	**249 D**	**28.2 B**	**293 D**	**99.9 D**	**45**	**76**	**36.1**
	Metals (µg/L)														
7440-38-2	**Arsenic**	25	NS	NS	NS	**9.1 J**	NS	NS	**47**	**22**	**44**	**42**	NS	NS	NS
7439-89-6	**Iron**	300	NS	NS	NS	**22,400**	NS	NS	**110,000**	**12,500**	**41,200**	**56,100**	NS	NS	NS
7439-96-5	**Manganese**	300	NS	NS	NS	**5,100**	NS	NS	**7,000 B**	**2,800**	**3,800**	**4,000**	NS	NS	NS
	Biological Analyses (cells/mL)														
NA	**Dehalococcoides (Dhc)**	NA	NS	NS	NS	NS	NS	**4.00E+07**	**6.00E+08**	**4.00E+07**	**4.82E+08**	**2.51E+09**	**1.36E+04**	**7.10E+05**	**7.90E+04**
NA	**Dehalobacter (Dhb)**	NA	NS	NS	NS	NS	NS	**5.00E+05**	**7.00E+07**	**3.00E+06**	**3.32E+07**	**2.41E+08**	**4.61E+05**	**4.81E+05**	**1.35E+04**
NA	**tceA Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**1.30E+04**	**2.60E+04**	**2.59E+03**
NA	**BAV1 VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**1.07E+03**	**3.97E+03**	**3.34E+01**
NA	**VC Reductase**	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**7.23E+03**	**6.84E+04**	**8.34E+03**
	Water Quality Parameters														
NA	**pH**	NA	NS	**7.56**	NS	**6.77**	**7.34**	**6.30**	**6.60**	**6.89**	**6.82**	**7.15**	**6.86**	**6.61**	**6.36**
NA	**ORP (mV)**	NA	NS	**-101**	NS	**-46.0**	**-108**	**-42.0**	**-98.8**	**-149.0**	**-88.7**	**-119.0**	**-84.2**	**-64.7**	**-45.1**
NA	**Dissolved Oxygen (mg/L)**	NA	--	--	--	--	--	--	--	--	--	--	**0.55**	**0.55**	**3.10**

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - Not Applicable
NS - Not Sampled
U/ND - The compoud was not detected at a concentration greater than or equal to the MDL.
CVOC - Chlorinated Volatile Organic Compound
J - The concentration given is an approximate value. The concentration is less than the reporting limit (RL) and greater than or equal to the MDL.
D - The reported value is from a secondary dilution analysis factor.
E - The compound concentration exceeded the calibration range.
F1 - MS and/or MSD recovery is outside accepted limits
* Laboratory control sample (LCS) or LCS Duplicate (LCSD) exceeds the control limits.
B - Compound was found in the blank and sample.
H - Sample was prepped or analyzed beyond the specified holding time
^ - Instrument related QC is outside acceptance limit
MS-09 - Matrix spike recovery and/or matri spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.
V-05 - Continuing calibration did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
V-34 - Initial calibration verification (ICV) id not meet method specifications and was biased on the low side for this compound. Reported result is estimated.
L-04 - Laboratory fortified blank/laboratory control sample recovery and duplicate recovery are outside of control limits. Reported value for this compound is likely to be biased on the low side.
MS-07A - Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery. Possiblity of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.

Table 2-10a
June 2013 Shallow Soil Analytical Results, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID / Date / Matrix		Part 375 Restricted: Protection of: Groundwater	Part 375 Restricted: Protection of: Public Health - Commercial	SB-1 (3-4') 6/19/2013 SOIL	SB-2 (1-2') 6/19/2013 SOIL	SB-3 (1-2') 6/19/2013 SOIL	SB-4 (2-3') 6/19/2013 SOIL	SB-5 (1-2') 6/19/2013 SOIL
CAS No.	*VOC (µg/Kg)*							
71-55-6	1,1,1-Trichloroethane	680	500,000	**580**	80 U	490 U	100 U	560 U
79-34-5	1,1,2,2-Tetrachloroethane	NS	NS	58 U	80 U	490 U	100 U	560 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	58 U	80 U	490 U	100 U	**4,700**
79-00-5	1,1,2-Trichloroethane	NS	NS	58 U	80 U	490 U	100 U	560 U
75-34-3	1,1-Dichloroethane	270	240,000	**390**	80 U	490 U	100 U	230 J
75-35-4	1,1-Dichloroethene	330	500,000	**87**	80 U	490 U	**270**	560 U
120-82-1	1,2,4-Trichlorobenzene	NS	NS	58 U	80 U	490 U	630 U	560 U
96-12-8	1,2-Dibromo-3-chloropropane	NS	NS	58 U	80 U	490 U	100 U	560 U
106-93-4	1,2-Dibromoethane	NS	NS	58 U	80 U	490 U	100 U	560 U
95-50-1	1,2-Dichlorobenzene	1,100	500,000	58 U	80 U	490 U	**26,000** D	**3,400**
107-06-2	1,2-Dichloroethane	20	30,000	**500**	80 U	490 U	**2,000**	**690**
78-87-5	1,2-Dichloropropane	NS	NS	58 U	80 U	490 U	100 U	560 U
541-73-1	1,3-Dichlorobenzene	2,400	280,000	58 U	80 U	490 U	100 U	560 U
106-46-7	1,4-Dichlorobenzene	1,800	130,000	58 U	80 U	490 U	**7,300**	**5,400**
78-93-3	2-Butanone (Methyl ethyl ketone)	120	500,000	58 U	**260** J	490 U	**1,100**	560 U
591-78-6	2-Hexanone (Methyl butyl ketone)	NS	NS	58 U	80 U	490 U	100 U	560 U
108-10-1	4-Methyl-2-pentanone	NS	NS	58 U	80 U	490 U	**430** J	560 U
67-64-1	Acetone	50	500,000	58 U	**420**	490 U	**19,000**	560 U
71-43-2	Benzene	60	44,000	**110**	80 U	490 U	**610**	**480** J
75-27-4	Bromodichloromethane	NS	NS	58 U	80 U	490 U	100 U	560 U
75-25-2	Bromoform	NS	NS	58 U	80 U	490 U	100 U	560 U
74-83-9	Bromomethane	NS	NS	58 U	80 U	490 U	100 U	560 U
75-15-0	Carbon disulfide	NS	NS	58 U	80 U	490 U	100 U	**740**
56-23-5	Carbon tetrachloride	760	22,000	58 U	80 U	490 U	100 U	560 U
108-90-7	Chlorobenzene	1,100	500,000	58 U	80 U	490 U	**15,000** D	560 U
75-00-3	Chloroethane	NS	NS	58 U	80 U	490 U	100 U	560 U
67-66-3	Chloroform	370	350,000	**450**	80 U	490 U	100 U	**28,000**
74-87-3	Chloromethane	NS	NS	58 U	80 U	490 U	100 U	560 U
156-59-2	cis-1,2-Dichloroethene	250	500,000	**6,600** D	**430**	**1,000**	**94,000** D	**15,000**
10061-01-5	cis-1,3-Dichloropropene	NS	NS	58 U	80 U	490 U	100 U	560 U
110-82-7	Cyclohexane	NS	NS	**340**	**530**	490 U	100 U	**16,000**
124-48-1	Dibromochloromethane	NS	NS	58 U	80 U	490 U	100 U	560 U
75-71-8	Dichlorodifluoromethane	NS	NS	58 U	80 U	490 U	100 U	560 U
100-41-4	Ethylbenzene	1,000	390,000	**49 J**	**53 J**	490 U	**120**	**3,900**
98-82-8	Isopropylbenzene	NS	NS	**88**	**27 J**	490 U	100 U	**3,000**
79-20-9	Methyl acetate	NS	NS	**52 J**	**260**	490 U	**120**	560 U
1634-04-4	Methyl tert-butyl ether	930	500,000	58 U	80 U	490 U	100 U	560 U
108-87-2	Methylcyclohexane	NS	NS	**2,300**	**2,100**	**380 J**	**250**	**64,000 D**
75-09-2	Methylene chloride	50	500,000	58 U	80 U	490 U	**1,300**	**3,500**
100-42-5	Styrene	NS	NS	58 U	80 U	490 U	100 U	560 U
127-18-4	Tetrachloroethene	1,300	150,000	**4,900**	**11,000**	**28,000**	**5,400**	**11,000**
108-88-3	Toluene	700	500,000	**85**	**87**	490 U	**630**	**2,300**
156-60-5	trans-1,2-Dichloroethene	190	500,000	**130**	80 U	490 U	**3,700**	560 U
10061-02-6	trans-1,3-Dichloropropene	NS	NS	58 U	80 U	490 U	100 U	560 U
79-01-6	Trichloroethene	470	200,000	**11,000**	**550**	**4,500**	**22,000** D	**85,000** D
75-69-4	Trichlorofluoromethane	NS	NS	58 U	80 U	490 U	100 U	**1,000**
75-01-4	Vinyl chloride	20	13,000	**540**	80 U	490 U	**8,400**	**2,700**
	Xylene (Total)	1,600	500,000	**540**	**440**	490 U	**760**	**11,000**
Total CVOCs		NA	NA	**28,405**	**13,197**	**30,940**	**208,390**	**260,360**
Total VOCs		NA	NA	**28,741**	**16,157**	**33,880**	**208,390**	**262,040**

Notes:

All results are reported in micrograms per kilogram (µg/kg).

NS - No objective established for the compound.

NA - Not applicable.

BOLD - The compound was detected at a concentration above the method detection limit (MDL).

BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than Part 375 Restricted Protection of Groundwater.

U - The compound was not detected at a concentration greater than or equal to the MDL.

J - The concentration given is an approximate value. Concentration is less than the reporting limit (RL) but greater than the MDL.

D - The reported value is from a secondary dilution analysis factor.

Table 2-10b
June 2013 Shallow Soil Analytical Results Exceedance Summary, Duso Site
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID		Part 375 Restricted: Protection of		SB-1 (3-4')	SB-2 (1-2')	SB-3 (1-2')	SB-4 (2-3')	SB-5 (1-2')
Date		Groundwater	Public Health - Commercial	6/19/2013	6/19/2013	6/19/2013	6/19/2013	6/19/2013
Matrix				SOIL	SOIL	SOIL	SOIL	SOIL
CAS No.	*VOC (µg/Kg)*							
75-34-3	**1,1-Dichloroethane**	270	240,000	**390**	80 U	490 U	100 U	230 J
95-50-1	**1,2-Dichlorobenzene**	1,100	500,000	58 U	80 U	490 U	**26,000** D	**3,400**
107-06-2	**1,2-Dichloroethane**	20	30,000	**500**	80 U	490 U	**2,000**	**690**
106-46-7	**1,4-Dichlorobenzene**	1,800	130,000	58 U	80 U	490 U	**7,300**	**5,400**
78-93-3	**2-Butanone (Methyl ethyl ketone)**	120	500,000	58 U	**260** J	490 U	**1,100**	560 U
67-64-1	**Acetone**	50	500,000	58 U	**420**	490 U	**19,000**	560 U
71-43-2	**Benzene**	60	44,000	**110**	80 U	490 U	**610**	**480** J
108-90-7	**Chlorobenzene**	1,100	500,000	58 U	80 U	490 U	**15,000** D	560 U
67-66-3	**Chloroform**	370	350,000	**450**	80 U	490 U	100 U	**28,000**
156-59-2	**cis-1,2-Dichloroethene**	250	500,000	**6,600** D	**430**	**1,000**	**94,000** D	**15,000**
100-41-4	**Ethylbenzene**	1,000	390,000	**49 J**	**53 J**	490 U	**120**	**3,900**
75-09-2	**Methylene chloride**	50	500,000	58 U	80 U	490 U	**1,300**	**3,500**
127-18-4	**Tetrachloroethene**	1,300	150,000	**4,900**	**11,000**	**28,000**	**5,400**	**11,000**
108-88-3	**Toluene**	700	500,000	**85**	**87**	490 U	**630**	**2,300**
156-60-5	**trans-1,2-Dichloroethene**	190	500,000	**130**	80 U	490 U	**3,700**	560 U
79-01-6	**Trichloroethene**	470	200,000	**11,000**	**550**	**4,500**	**22,000** D	**85,000** D
75-01-4	**Vinyl chloride**	20	13,000	**540**	80 U	490 U	**8,400**	**2,700**
	Xylene (Total)	1,600	500,000	**540**	**440**	490 U	**760**	**11,000**

Notes:

All results are reported in micrograms per kilogram (µg/kg).

NS - No objective established for the compound.

NA - Not applicable.

BOLD - The compound was detected at a concentration above the method detection limit (MDL).

BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than Part 375 Restricted Protection of Groundwater.

U - The compound was not detected at a concentration greater than or equal to the MDL.

J - The concentration given is an approximate value. Concentration is less than the reporting limit (RL) but greater than the MDL.

D - The reported value is from a secondary dilution analysis factor.

Table 2-11
Post-EISB Performance Evaluation
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Well ID	Criteria	GEOCHEMISTRY: ORP		pH		General Chemistry			Chlorinated Ethanes: Parent CVOC	Daughter Products			Moles		Chlorinated Ethenes: Parent CVOCs	Daughter Products			Moles		CVOCs: Total CVOC Reduction							Microbes: Dehalococcoides	Dehalobacter	Evaluation
		ORP <-75 (pre-injection)	ORP<-75 (October 2016)	pH (6-8.5) (pre-injection)	pH (6-8.5) (October 2016)	TOC increase	Sulfate decrease (April 2014)	Methane increase	1,1,1-TCA decrease	1,1-DCA/ 1,2-DCA decrease	Chloroethane increase	Ethane Increase	Total Moles Ethanes Decrease	Percent Reduction Moles of Chlorinated Ethanes	PCE/TCE decrease	cis-1,2-DCE decrease	VC decrease	Ethene Increase	Total Moles Ethenes Decrease	Percent Reduction Moles of Chlorinated Ethenes	Pre-Injection (2011 - 2012) µg/L	Post-Injection (Dec. 2014) µg/L	Post-Injection (April 2015) µg/L	Post-Injection (October 2015) µg/L	Post-Injection (October 2016) µg/L	Annual Percent Reduction	Overall Percent Reduction	Dehalococcoides >10^7 cells/L (October 2016)	Dehalobacter >10^6 cells/L (October 2016)	
BIW-1S		N	Y	Y	N	-	Y	-	N	N/N	Y	-	N	Increase	Y/N	N	ND	-	N	Increase	17.2	3,857	7,112	6,632	12,421	Increase	Increase	-	-	Low
BIW-1D		N	Y	Y	Y	Y	Y	Y	Y	Y/Y	Y	ND	Y	95%	ND/ND	N	ND	ND	Y	100%	6,233	727	143	323	218	33%	97%	Y (4.51E+07)	Y (2.78E+07)	Strong
BIW-2S		N	Y	Y	Y	Y	Y	Y	Y	Y/N	Y	N	Y	83%	Y/Y	Y	Y	N	Y	100%	16,374	942	1,329	3,460	1,528	56%	91%	-	-	Strong
BIW-2D[1]		N	Y	Y	Y	-	Y	-	Y	Y/N	Y	-	N	Increase	Y/Y	Y	ND	-	Y	94%	45.7	13.1	1,255	36.6	74.9	Increase	Increase	-	-	Moderate
BIW-3S		N	Y	Y	Y	-	-	-	ND	ND/ND	ND	-	ND	-	Y/Y	ND	ND	-	Y	100%	12.3	3.49	-	2.7	2.0	26%	84%	-	-	Strong
BIW-3D		N	Y	Y	N	-	-	-	ND	ND/ND	ND	-	ND	-	Y/Y	ND	ND	-	Y	100%	1.8	2.4	-	0.6	0.0	100%	100%	-	-	Strong
BIW-4		N	Y	Y	Y	-	-	-	ND	ND/ND	ND	-	ND	-	Y/Y	N	ND	-	Y	80%	6.4	45.0	-	3.6	1.8	50%	72%	-	-	Strong
BIW-5S		N	Y	Y	N	Y	N	Y	N	N/N	Y	ND	N	Increase	Y/Y	N	Y	ND	N	Increase	1,795	77,120	4,369	66,129	129,340	Increase	Increase	Y (1.12E+09)	Y (4.20E+09)	Low
BIW-5D		N	Y	Y	Y	Y	Y	Y	N	Y/Y	Y	ND	N	Increase	Y/Y	Y	Y	Y	Y	100%	122,562	141,400	32,300	66,400	98,200	Increase	20%	Y (6.02E+08)	Y (4.52E+09)	Moderate
BIW-6S		N	Y	Y	Y	Y	N	-	Y	Y/Y	Y	-	N	Increase	Y/Y	Y	Y	-	Y	91%	273	291	221	170	391	Increase	Increase	-	-	Moderate
BIW-6D		N	Y	Y	Y	-	-	-	Y	Y/Y	Y	-	Y	25%	ND/ND	ND	ND	-	ND	-	37.6	68.8	-	26.7	18.4	31%	51%	-	-	Strong
MHC-22		Y	Y	Y	Y	-	-	-	ND	ND/ND	ND	-	ND	-	Y/Y	Y	Y	-	Y	90%	274	21.1	515	21.7	26.3	Increase	90%	-	-	Moderate
MHC-23		N	Y	Y	Y	Y	Y	Y	Y	Y/Y	Y	ND	N	Increase	Y/Y	Y	Y	ND	Y	100%	6,516	11,490	10,815	5,700	3,572	37%	45%	Y (1.90+E09)	Y (1.17E+08)	Strong
MHC-24		Y	Y	Y	Y	-	-	-	ND	N/N	Y	-	N	Increase	ND/Y	Y	Y	-	Y	94%	30.3	15.7	-	10.4	24.1	Increase	20%	-	-	Moderate
MHC-25S		N	Y	Y	Y	-	-	-	ND	Y/Y	Y	-	Y	64%	ND/ND	ND	ND	-	ND	-	6.4	6.1	-	9.5	1.7	82%	73%	-	-	Strong
MHC-26		Y	Y	Y	Y	Y	-	Y	Y	Y/ND	Y	-	Y	1%	ND/Y	Y	Y	-	Y	100%	4,217	6,510	730	5,002	2,300	54%	45%	Y (2.51E+09)	Y (2.41E+08)	Strong
Summary		ORP has been measured to decrease in all monitoring wells. Reducing conditions favorable for reductive dechlorination observed across the injection area.		Circumneutral pH is required for biodegradation; most wells remain within the favorable range.		Increases in TOC in all monitoring wells indicates distribution of injected carbon substrates. Decrease in sulfate in six of eight monitoring wells indicate sulfate-reducing conditions throughout the injection area. Sulfate-reducing conditions are an indicator of conditions favorable for reductive dechlorination. Increases in Methance in all of the wells indicates highly reducing conditions.			Decreases in 1,1,1-TCA and DCA and increases in chloroethane demonstrate that reductive dechlorination is occurring throughout the injection area. Increases in total moles of chlorinated ethanes occurs as 1,1,1-TCA and DCA desorbs from soil and chloroethane accumulates as the terminal dechlorination product.						Decrease in PCE and TCE demonstrate reductive dechlorination of parent chlorinated ethenes across the injection area, which yields increases in sequential dechlorination products (DCE and VC). As reductive dechlorination reactions proceed DCE and VC concentrations decrease as well generating terminal product of ethene. Increases in ethene and reduction in total moles of chlorinated ethenes indicates complete dechlorination is occurring in the injection area. Increases in total moles of chlorinated ethenes occurs as PCE and TCE desorbs from soil. Wells where total moles increased, PCE and TCE have been dechlorinated to DCE and VC, which can be further dechlorinated.						Total CVOC concentrations have been reduced in a majority of monitoring wells within the injection area, demonstrating treatment as part of the pilot study. Some wells where CVOC concentrations increased may have occurred from upward transport of CVOCs as a result of injections.							Bacteria that can completely dechlorinate chlorinated ethenes (Dehalococcoides) were measured at ideal quantities at all seven wells tested. Bacteria that dechlorinate chlorinated ethanes (Dehalobacter) were measured at ideal quantities at all seven wells tested. Ideal bacteria counts exist across the injection area.		Strong – has all or nearly all of the following • favorable pH and ORP • favorable cell counts • ethene/ethane detected • methane is more than pre-injection • increases in daughter products in the last 3-6 months (DCA, chloroethane, cis-DCE) and/or decreases in CVOCs in last 3-6 months • sulfate is less than pre-injection Moderate – has 2 to 3 of the above list, with greater emphasis on cell counts, ethene/ethane, changes in concentrations indicative of ERD Low – has 0 to 2 of the above list

Notes:

ORP	oxidation reduction potential
TOC	total organic carbon
CVOC	chlorinated volatile organic compounds
1,1,1-TCA	1,1,1-trichloroethane
1,1-DCA	1,1-dichloroethane
1,2-DCA	1,2-dichloroethane
PCE	tetrachloroethene
TCE	trichloroethene
1,2-DCE	1,2-dichloroethene
VC	vinyl chloride
µg/L	micrograms per liter
Y	Yes
N	No
Green cells	indicate a positive response to the injections
Red cells	indicate a negative response to the injections
-	Not Sampled or No Data Available
ND	The compound was not detected at a concentration greater than or equal to the method detection limit.

1. Injection not performed in the vertical interval corresponding to well screen

Table 2-12
Soil Analytical Data Exceedances Summary,
MHBP Treatment Area
Former Duso Chemical Company
Poughkeepsie, New York
NYSDEC Site No. 314103

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	DC-ISB-01	DC-ISB-01	DC-ISB-01	DC-ISB-02	DC-ISB-02	DC-ISB-02	DC-ISB-03	DC-ISB-03	DC-ISB-03	DC-ISB-04	DC-ISB-04	DC-ISB-04
Date					12/20/2016	12/21/2016	12/21/2016	12/29/2016	12/29/2016	12/29/2016	12/23/2016	12/23/2016	12/23/2016	12/30/2016	12/30/2016	1/3/2017
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	14-15	16-17	62-63	6-7	18-19	37-37.5	7-8	19-20	48-49	13-14	15-16	65-66.2
Area					Area B	Area B	Area B	Area B	Area B	Area B	Area C	Area C	Area C	Area C	Area C	Area C
CAS No.	VOC (mg/Kg) (1)			mg/kg												
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	0.08	0.00096 U	0.0012 U	**9.2**	0.0077 U	0.00082 U	**0.33**	**0.0049**	0.0012 U	0.0011 U	0.0096 U	0.00081 U
75-34-3	1,1-Dichloroethane	0.27	240	0.27	**17**	**0.093**	**0.014**	**1.5**	**1.1**	**0.0025**	**0.27**	**2.5**	**0.0031**	**1.3**	**2.7**	**0.0064**
75-35-4	1,1-Dichloroethene	0.33	500	0.33	**2.6**	**0.056**	0.0013 U	**1.1**	**5.2**	0.0009 U	**0.84**	**2.5**	0.0013 U	**0.66**	**1.7**	0.00089 U
107-06-2	1,2-Dichloroethane	0.02	30	0.02	**1.7**	**0.029**	0.0015 U	0.015 U	**0.37**	0.0011 U	**0.015**	**1.6**	0.0016 U	**0.048**	**0.082**	0.001 U
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	0.088	0.075	0.021 U	0.19 U	0.14 U	0.014 U	0.016 U	**0.21**	0.021 U	0.019 U	0.17 U	0.014 U
67-64-1	Acetone	0.05	500	0.05	**1.4**	**1.5**	0.028 U	0.39 U	**7.5**	0.019 U	**0.097**	**7.9**	0.028 U	0.026 U	0.36 U	0.019 U
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25	0.0011 U	0.00077 U	0.00094 U	0.012 U	0.0086 U	0.00066 U	0.00072 U	**0.014**	0.00097 U	0.00087 U	0.011 U	0.00064 U
75-01-4	Vinyl chloride	0.02	13	0.02	**0.062**	**0.1**	0.0013 U	0.011 U	0.0078 U	0.0009 U	0.00099 U	**0.047**	0.0013 U	0.0012 U	0.0098 U	0.00089 U

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	DC-ISB-05	DC-ISB-05	DC-ISB-05	DC-ISB-06	DC-ISB-06	DC-ISB-06	DC-ISB-07	DC-ISB-07	DC-ISB-07	DC-ISB-08	DC-ISB-08	DC-ISB-08
Date					12/28/2016	12/28/2016	12/29/2016	1/4/2017	1/4/2017	1/4/2017	12/20/2016	12/20/2016	12/20/2016	12/19/2016	12/19/2016	12/20/2016
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	6-7	18-19	50-51	18-19	21-22	57-58	7-8	16-17	39.5-40.5	17-18	21-22	48-49.1
Area					Area A	Area A	Area B	Area B	Area B	Area B	Area A	Area A	Area A	Area A	Area A	Area A
CAS No.	VOC (mg/Kg) (1)			mg/kg												
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	**2.5**	0.0011 U	0.0011 U	0.001 U	0.0011 U	0.00082 U	0.0011 U	0.00099 U	0.00082 U	0.00097 U	0.0012 U	0.0015 U
75-34-3	1,1-Dichloroethane	0.27	240	0.27	**0.19**	**0.12**	**0.013**	**0.002**	**0.0089**	0.00057 U	**0.12**	0.0007 U	**0.011**	**0.016**	**0.14**	**0.005**
75-35-4	1,1-Dichloroethene	0.33	500	0.33	**0.1**	**0.024**	**0.015**	0.0011 U	**0.0048**	0.0009 U	**0.13**	0.0011 U	0.0009 U	0.0011 U	0.0014 U	0.0016 U
107-06-2	1,2-Dichloroethane	0.02	30	0.02	**0.01**	**0.073**	**0.057**	0.0013 U	0.0014 U	0.0011 U	**0.018**	0.0013 U	0.0019	**0.0047**	0.0016 U	**0.0083**
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	0.018 U	**0.073**	0.02 U	**0.099**	0.019 U	0.014 U	0.019 U	0.017 U	0.014 U	**0.18**	0.022 U	0.025 U
67-64-1	Acetone	0.05	500	0.05	0.024 U	**0.23**	0.026 U	**1.6**	0.026 U	0.019 U	0.026 U	**0.11**	0.019 U	**0.27**	0.029 U	0.034 U
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25	**0.0021**	0.00092 U	**0.11**	0.00081 U	0.00088 U	0.00065 U	**0.003**	0.0008 U	**0.0088**	0.00078 U	0.00099 U	0.0012 U
75-01-4	Vinyl chloride	0.02	13	0.02	0.0011 U	**0.096**	**0.078**	0.0011 U	0.0012 U	0.0009 U	0.0012 U	0.0011 U	**0.031**	**0.08**	**0.093**	0.0016 U

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	PR-SB1	PR-SB1	PR-SB2	PR-SB2	PR-SB3	PR-SB3	DUP-1 042617 (PR-SB4)	PR-SB4	PR-SB4	PR-SB4	PR-SB5	PR-SB5
Date					4/24/2017	4/24/2017	4/25/2017	4/25/2017	4/25/2017	4/25/2017	4/26/2017	4/26/2017	4/26/2017	4/26/2017	4/26/2017	4/27/2017
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	5-6	16-18	6.5-8	13.5-15	8.5-10	18.5-20	13.5-15	13.5-15	17-18.5	26-27.5	7-8.5	18.5-20
Area					Area A	Area A	Area A	Area A		Area A	Area B (south)	Area B (south)	Area B (south)	Area B (south)	Area A	Area A
CAS No.	VOC (mg/Kg) (1)			mg/kg												
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	0.002 U	0.0018 U	0.0021 U	0.0018 U	0.0018 U
75-34-3	1,1-Dichloroethane	0.27	240	0.27	**0.017**	0.0016 U	**13 (Note 4)**	**0.029**	**2.1 (Note 4)**	0.0018 U	**0.023**	**0.05**	0.0018 U	**0.015**	**0.16**	0.0018 U
75-35-4	1,1-Dichloroethene	0.33	500	0.33	0.0041 U	0.0032 U	**0.004**	**0.028**	0.0036 U	0.0036 U	**0.018**	**0.037**	0.0036 U	**0.014**	**0.066**	0.0035 U
107-06-2	1,2-Dichloroethane	0.02	30	0.02	**0.0024**	0.0016 U	**3.2 (Note 4)**	**0.0064**	0.0018 U	0.0018 U	0.0028 U	**0.0082**	0.0018 U	0.0021 U	**0.015**	0.0018 U
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	0.041 U	0.032 U	0.029 U	**0.063**	0.036 U	0.036 U	**0.1**	**0.13**	0.036 U	0.042 U	0.036 U	0.035 U
67-64-1	Acetone	0.05	500	0.05	0.1 U	**0.083**	0.073 U	**0.78**	0.09 U	0.089 U	**1.7**	**1.7**	**0.54**	**0.57**	0.091 U	**0.13**
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25	0.002 U	0.0016 U	0.0015 U	0.002 U	0.0018 U	0.0018 U	0.0019 U	**0.0023**	0.0018 U	0.0021 U	**0.012**	0.0018 U
75-01-4	Vinyl chloride	0.02	13	0.02	0.01 U	0.0079 U	**0.032**	**0.037**	**0.066**	0.0089 U	**0.022**	**0.025**	0.0089 U	0.01 U	**0.012**	0.0088 U

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	PR-SB6	PR-SB6	PR-SB7	PR-SB7	PR-SB8	PR-SB8	PR-SB9	DUP-2 042817 (PR-SB9)	PR-SB9	PR-SB10	PR-SB10	PR-SB11
Date					4/27/2017	4/27/2017	4/27/2017	4/27/2017	4/27/2017	4/27/2017	4/28/2017	4/28/2017	4/28/2017	4/28/2017	4/28/2017	5/1/2017
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	8.5-10	12-13.5	2-5	18.5-20	13.5-15	15-17	3.5-5	18.5-20	18.5-20	7-8.5	18.5-20	9-11
Area					Area C	Area C	Area C	Area C	Area B (north)	Area B (north)	Area C	Area C	Area C	Area C	Area C	Area C
CAS No.	VOC (mg/Kg) (1)			mg/kg												
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	**5.7 (Note 4)**	**0.0068**	**2.2 (Note 4)**	0.0018 U	0.0016 U	0.0018 U	**0.045**	0.0015 U	0.0016 U	0.0017 U	0.0017 U	0.0021 U
75-34-3	1,1-Dichloroethane	0.27	240	0.27	**14 (Note 4)**	**17 (Note 4)**	**6.3 (Note 4)**	0.0018 U	**0.0038**	**0.0098**	**0.12**	**0.0016**	**0.003**	**0.66 (Note 4)**	0.0017 U	**0.0025**
75-35-4	1,1-Dichloroethene	0.33	500	0.33	**2 (Note 4)**	**1.7 (Note 4)**	**7.2 (Note 4)**	0.0037 U	**0.025**	**0.02**	**2.4 (Note 4)**	0.0031 U	0.0032 U	**0.13**	0.0034 U	0.0043 U
107-06-2	1,2-Dichloroethane	0.02	30	0.02	**4.5**	**5**	**0.042**	0.0018 U	0.0016 U	0.0018 U	0.0017 U	0.0015 U	0.0016 U	**0.032**	0.0017 U	0.0021 U
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	0.056 U	0.037 U	0.039 U	0.037 U	**0.035**	**0.058**	0.035 U	0.031 U	0.032 U	0.034 U	**0.074**	0.043 U
67-64-1	Acetone	0.05	500	0.05	0.14 U	**0.31**	**0.2**	**0.22**	**0.47**	**0.77**	0.087 U	**0.17**	0.079 U	**0.38**	**4 (Note 4)**	0.11 U
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25	**0.0059**	0.0019 U	**1.9**	0.0018 U	0.0016 U	0.0018 U	0.0017 U	0.0015 U	0.0016 U	0.0017 U	0.0017 U	0.0021 U
75-01-4	Vinyl chloride	0.02	13	0.02	0.014 U	**0.015**	**0.034**	0.0092 U	0.0081 U	0.0091 U	0.0087 U	0.0076 U	0.0079 U	0.0084 U	0.0086 U	0.011 U

Sample ID		Part 375 Restricted:		Part 375 Non Restricted	PR-SB11	PR-SB12	PR-SB12	PR-SB13	PR-SB13
Date					5/1/2017	5/1/2017	5/1/2017	5/2/2017	5/2/2017
Depth		Groundwater	Public Health - Commercial	Soil Cleanup Objectives	18.5-20	5-7	15-17	8.5-9	15-17
Area					Area C	Area C	Area C	Area B (north) in MHBP building	Area B (north) in MHBP building
CAS No.	VOC (mg/Kg) (1)			mg/kg					
71-55-6	1,1,1-Trichloroethane	0.68	500	0.68	0.0019 U	0.0022 U	0.0019 U	0.0023 U	0.002 U
75-34-3	1,1-Dichloroethane	0.27	240	0.27	0.0019 U	**0.091**	**0.0067**	0.0023 U	0.002 U
75-35-4	1,1-Dichloroethene	0.33	500	0.33	0.0037 U	**0.065**	**0.0098**	0.0045 U	0.004 U
107-06-2	1,2-Dichloroethane	0.02	30	0.02	0.0019 U	**0.005**	0.0019 U	0.0023 U	0.002 U
78-93-3	2-Butanone (Methyl ethyl ketone)	0.12	500	0.12	0.037 U	0.043 U	0.039 U	0.045 U	0.04 U
67-64-1	Acetone	0.05	500	0.05	0.093 U	0.11 U	**0.17**	0.11 U	0.099 U
156-59-2	cis-1,2-Dichloroethene	0.25	500	0.25	0.0019 U	0.0022 U	0.0019 U	0.0023 U	0.002 U
75-01-4	Vinyl chloride	0.02	13	0.02	0.0093 U	0.011 U	0.0097 U	0.011 U	0.0099 U

Notes:
See Page 2 for Notes.

Notes:

(1) The Method Detection Limits are listed for non-detect data where available. The Reporting Limit is listed for the April 2017 data as this is what is provided in the laboratory analytical reports.

BOLD - The compound was detected at a concentration above the method detection limit (MDL).

BOLD/BLUE SHADING - The compound was detected above Part 375 Restricted Soil Cleanup Objectives for Protection of Groundwater (within the treatment area).

(2) Acronyms

NS - No Criteria established for the compound
NA - Not applicable
NL - data not located
U/ND - The compound was not detected at a concentration greater than or equal to the MDL.
limit (RL) but greater than MDL.
E - Results exceed calibration range.
D - The reported value is from a secondary dilution analysis factor.
B - The compound was also detected in the associated Method Blank.
R - Sample result rejected, presence/absence of analyte not verified.
H - Sample was prepped or analyzed beyond the specified holding time.

(3) Grey shading/Blank cells: data not available from documentation or parameter not analyzed.

(a) 1998 MHC boring data only available in report data tables. MDL not provided for non-detect data.
(b) The O&G 2007. Data that was not located in Table 5 of the 2007 O&G report is shown as grey. Lab report not available to confirm data availability.
(c) August 2011 "SB-" boring data. Minimal data with MDL not provided for non-detects. No lab report to confirm data availability.
(d) 2012 "TW-" boring parameter not analyzed.
(e) December 2016 "DC-ISB" and April 2017 "PR-SB" boring parameter not analyzed based on analytical data.

(4) The highest value is presented when two analytical results are provided due to dilution or a wet vs. dry sample.

Table 2-13
Groundwater Emerging Contaminants Results (2018 - 2021)
Former Duso Chemical Site
Poughkeepsie, Dutchess County, New York
NYSDEC Site No. 314103

Well ID	Proposed NYSDEC AWQ GV[1]	BIW-1S	BIW-1D	BIW-1D	BIW-2S	BIW-5S	BIW-5D	BIW-5D	BIW-6D	MHBP-11	MHBP-12	MHBP-13S	MHBP-19S
Date		11/2/2021	11/2/2021	11/2/21 (DUP)	11/3/2021	11/2/2021	5/16/2018	11/2/2021	5/16/2018	11/1/2021	11/1/2021	11/1/2021	5/16/2018
Per- and Polyfluoroalkyl Substances (ng/L)													
Perfluorobutanoic acid (PFBA)	--	**11**	0.77 U	0.78 U	**2.0** J	**12**	**59**	**2.0** J	**3.3**	**14**	**2.4** J	**4.8**	**8.9**
Perfluoropentanoic acid (PFPeA)	--	**32**	0.41 U	0.41 U	**2.2**	**17**	**6.0**	**3.5**	**2.1**	**44**	**3.5**	**6.1**	**5.3**
Perfluorohexanoic acid (PFHxA)	--	**16**	0.39 U	0.39 U	**2.1**	**11**	**4.6**	**2.0**	**0.46** J	**21**	**0.65** J	**3.2**	**4.0**
Perfluoroheptanoic acid (PFHpA)	--	**15**	0.20 U	0.21 U	**2.0** I	**8.7**	**1.8**	**1.1** J	**0.45** J	**17**	0.20 U	**2.6**	**2.3**
Perfluorooctanoic acid (PFOA)	6.7	**16**	0.36 U	0.37 U	**9.1**	**12**	**5.4** B	**1.9**	**1.6** J B	**15**	0.36 U	**3.4**	**4.7** B
Perfluorononanoic acid (PFNA)	--	**2.5**	0.24 U	0.24 U	**2.4**	**3.8**	**1.0** J	**0.30** J	ND	**2.8**	0.24 U	**0.64** J	**0.42** J
Perfluorodecanoic acid (PFDA)	--	**0.28** J	0.26 U	0.26 U	**0.85** J	**0.77** J	**0.84** J	0.27 U	ND	0.25 U	0.26 U	0.27 U	**0.40** J
Perfluoroundecanoic (PFUnA)	--	0.32 U	0.30 U	0.30 U	0.29 U	0.29 U	ND	0.31 U	ND	0.28 U	0.29 U	0.30 U	ND
Perfluorododecanoic acid (PFDoA)	--	0.36 U	0.33 U	0.33 U	0.33 U	0.32 U	ND	0.34 U	ND	0.31 U	0.32 U	0.34 U	ND
Perfluorotridecanoic acid (PFTriA)	--	0.40 U	0.37 U	0.38 U	0.37 U	0.36 U	ND	0.39 U	ND	0.35 U	0.37 U	0.38 U	ND
Perfluorotetradecanoic acid (PFTeA)	--	0.58 U	0.54 U	0.55 U	0.54 U	0.52 U	ND	0.56 U	ND	0.52 U	0.53 U	0.55 U	ND
Perfluorobutanesulfonic acid (PFBS)	--	**3.9**	0.22 U	0.22 U	**1.9**	**4.2**	**1.5** J	**0.63** J	ND	**2.6**	0.21 U	**1.1** J	**2.4**
Perfluorohexanesulfonic acid (PFHxS)	--	**4.4**	0.26 U	0.26 U	**2.3**	**3.3**	**1.0** J	0.27 U	ND	**4.8**	0.25 U	**1.2** J	ND
Perfluoroheptanesulfonic Acid (PFHpS)	--	0.22 U	0.20 U	0.20 U	**0.27** J	**0.48** J	ND	0.21 U	ND	**0.23** J I	0.20 U	0.20 U	ND
Perfluorooctanesulfonic acid (PFOS)	2.7	**12** I B	**0.36** J B	**0.32** J B	**18**	**23** B	**1.7**	**0.35** J	**0.29** J	**8.5** B	**0.29** J B	**7.5** B	**1.3** J
Perfluorodecanesulfonic acid (PFDS)	--	0.28 U	0.26 U	0.27 U	0.26 U	0.25 U	ND	0.27 U	ND	0.25 U	0.26 U	0.27 U	ND
Perfluorooctanesulfonamide (PFOSA)	--	0.53 U	0.50 U	0.50 U	0.49 U	0.48 U	ND	0.51 U	ND	0.47 U	0.49 U	0.50 U	ND
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	--	0.83 U	0.78 U	0.78 U	0.76 U	0.75 U	ND	0.80 U	ND	0.74 U	0.76 U	0.79 U	ND
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	--	0.69 U	0.64 U	0.65 U	0.63 U	0.62 U	ND	0.66 U	ND	0.61 U	0.63 U	0.65 U	ND
1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	--	**1.4** J	0.94 U	0.95 U	0.93 U	0.91 U	**12**	0.98 U	**1.8**	**1.6** J	0.92 U	0.96 U	**1.7**
1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	--	0.36 U	0.34 U	0.34 U	0.33 U	0.32 U	ND	0.35 U	ND	**0.51** J	0.33 U	0.34 U	**0.70** J
Total Per- and Polyfluoroalkyl Substances	--	**114.48**	**0.36**	**0.32**	**43.12**	**96.25**	**94.84**	**11.78**		**132.04**	**6.84**	**30.54**	**32.12**
1,4-Dioxane - µg/L	0.35	**1.7**	**1.2**	**1.3**	**1.6**	**1.7**	**1.2**	**3.3**	**1.3** E	**1.9**	**13**	**110** E	NA

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
[1] Proposed New York State Department of Environmental Conservation (NYSDEC) Ambient Water Quality Guidance Value
µg/L - micrograms per liter
ng/L - nanograms per liter
U - The compound was not detected at a concentration greater than or equal to the MDL. MDL is listed in this case.
J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
I - Value is EMPC (estimated maximum possible concentration).
B - Compound was found in the blank and sample.
MDL - Method Detection Limit
RL - Reporting Limit or Requested Limit (Radiochemistry)
E - Result exceeded calibration range.
BIW-2S incorrectly labeled BIW-25 in the laboratory report.
MHC-25S incorrectly labeled MCH-25S in the laboratory report.
ND - Not detected at the reporting limit (RL).
NA - Not analyzed

Table 2-13
Groundwater Emerging Contaminants Results (2018 - 2021)
Former Duso Chemical Site
Poughkeepsie, Dutchess County, New York
NYSDEC Site No. 314103

Well ID	Proposed NYSDEC AWQ GV[1]	MHBP-21D	MHC-23	MHC-25I	MHC-25S	MHC-26	MHC-29	OBG-7I	OBG-7I	OBG-7I	OBG-7S	OBG-8S	Equipment Blank	Field Blank	Field Blank
Date		11/3/2021	11/3/2021	5/16/2018	11/3/2021	11/2/2021	11/1/2021	5/16/2018	5/16/2018 (DUP-1)	11/1/2021	11/1/2021	5/16/2018	5/16/2018	5/16/2018	11/3/2021
Per- and Polyfluoroalkyl Substances (ng/L)															
Perfluorobutanoic acid (PFBA)	--	0.77 U	**13**	**3.1**	**2.4 J**	**7.4**	**28**	**4.5**	**6.2**	0.78 U	**6.0**	**5.6**	ND	ND	0.81 U
Perfluoropentanoic acid (PFPeA)	--	0.41 U	**16**	**0.84 J**	**1.7**	**11**	**98**	**3.0**	**3.5**	0.41 U	**2.9**	**5.3**	ND	**0.50 J**	0.43 U
Perfluorohexanoic acid (PFHxA)	--	0.39 U	**11**	ND	**1.4 J**	**8.5**	**54**	**1.9**	**1.5 J**	**0.52 J**	**3.2**	**3.4**	ND	ND	0.41 U
Perfluoroheptanoic acid (PFHpA)	--	0.20 U	**8.1**	**0.31 J**	**0.65 J**	**4.9**	**47**	**0.86 J**	**1.2 J**	**0.40 J**	**1.4 J**	**3.0**	ND	ND	0.22 U
Perfluorooctanoic acid (PFOA)	6.7	0.37 U	**13**	**1.4 J B**	**2.0**	**12**	**30**	**2.3 B**	**3.0 B**	0.37 U	**2.9**	**6.9 B**	ND	**0.76 J B**	0.39 U
Perfluorononanoic acid (PFNA)	--	**0.28 J**	**2.9**	ND	**0.65 J I**	**5.4**	**2.8**	**0.69 J**	**0.47 J**	0.24 U	**0.90 J**	**2.9**	ND	ND	**0.42 J**
Perfluorodecanoic acid (PFDA)	--	0.26 U	**0.58 J**	**0.50 J**	0.27 U	**6.8**	0.25 U	**1.5 J**	**1.5 J**	0.26 U	**0.48 J**	**1.3 J**	**0.94 J**	ND	0.28 U
Perfluoroundecanoic (PFUnA)	--	0.30 U	0.28 U	ND	0.30 U	**1.4 J**	0.29 U	ND	ND	0.30 U	0.29 U	ND	ND	ND	0.31 U
Perfluorododecanoic acid (PFDoA)	--	0.33 U	0.32 U	ND	0.34 U	**0.46 J**	0.32 U	ND	ND	0.33 U	0.32 U	ND	ND	ND	0.35 U
Perfluorotridecanoic acid (PFTriA)	--	0.37 U	0.36 U	ND	0.38 U	0.36 U	0.36 U	ND	ND	0.38 U	0.36 U	ND	ND	ND	0.40 U
Perfluorotetradecanoic acid (PFTeA)	--	0.54 U	0.52 U	ND	0.55 U	0.52 U	0.53 U	ND	ND	0.55 U	0.53 U	ND	ND	ND	0.58 U
Perfluorobutanesulfonic acid (PFBS)	--	0.22 U	**3.8**	**1.5 J**	**2.9**	**5.8**	**4.3**	ND	ND	**0.24 J**	**1.9**	**4.0**	ND	ND	0.23 U
Perfluorohexanesulfonic acid (PFHxS)	--	0.26 U	**3.4**	**0.90 J**	**1.5 J**	**2.6**	**7.4**	ND	ND	0.26 U	**0.59 J I**	**0.63 J**	ND	ND	0.28 U
Perfluoroheptanesulfonic Acid (PFHpS)	--	0.20 U	**0.49 J**	ND	0.20 U	**0.42 J**	**0.35 J**	ND	ND	0.20 U	0.19 U	ND	ND	ND	0.21 U
Perfluorooctanesulfonic acid (PFOS)	2.7	0.25 U	**29**	**3.9**	**5.3**	**58 B**	**15 B**	**0.83 J**	**0.56 J**	**0.40 J B**	**1.9 B**	**17**	ND	ND	0.27 U
Perfluorodecanesulfonic acid (PFDS)	--	0.26 U	0.25 U	ND	0.27 U	**0.37 J**	0.26 U	ND	ND	0.27 U	0.25 U	ND	ND	ND	0.28 U
Perfluorooctanesulfonamide (PFOSA)	--	0.50 U	0.48 U	ND	0.50 U	0.48 U	0.48 U	ND	ND	0.50 U	0.48 U	ND	ND	ND	0.53 U
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	--	0.78 U	0.74 U	ND	0.79 U	0.74 U	0.75 U	ND	ND	0.78 U	0.75 U	ND	ND	ND	0.82 U
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	--	0.64 U	0.61 U	ND	0.65 U	**0.94 J**	0.62 U	ND	ND	0.65 U	0.62 U	ND	ND	ND	0.68 U
1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	--	0.94 U	0.90 U	**4.6**	0.96 U	0.90 U	**2.5 J**	**15**	**0.61 J**	0.95 U	0.91 U	**9.3**	**1.3 J**	**0.80 J**	1.0 U
1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	--	0.34 U	0.32 U	**1.0 J**	0.34 U	0.32 U	0.33 U	**0.66 J**	ND	0.34 U	0.32 U	ND	ND	ND	0.36 U
Total Per- and Polyfluoroalkyl Substances	--	**0.28**	**101.27**	**18.05**	**18.50**	**125.99**	**289.35**	**31.24**	**18.54**	**1.56**	**22.17**	**59.33**	**2.24**	**2.06**	**0.42**
1,4-Dioxane - µg/L	0.35	**140 E**	**2.9**	ND	**0.44**	**2.9**	**2.4**	ND	ND	0.10 U	0.10 U	**0.13 J**	NA	NA	NA

Notes:
BOLD - The compound was detected at a concentration greater than or equal to the method detection limit (MDL).
BOLD/SHADED IN BLUE - The compound was detected at a concentration greater than New York State Ambient Water Quality Standards (AWQS) or Guidance Values (GV).
[1] Proposed New York State Department of Environmental Conservation (NYSDEC) Ambient Water Quality Guidance Value
µg/L - micrograms per liter
ng/L - nanograms per liter
U - The compound was not detected at a concentration greater than or equal to the MDL. MDL is listed in this case.
J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
I - Value is EMPC (estimated maximum possible concentration).
B - Compound was found in the blank and sample.
MDL - Method Detection Limit
RL - Reporting Limit or Requested Limit (Radiochemistry)
E - Result exceeded calibration range.
BIW-2S incorrectly labeled BIW-25 in the laboratory report.
MHC-25S incorrectly labeled MCH-25S in the laboratory report.
ND - Not detected at the reporting limit (RL).
NA - Not analyzed

Appendix A

Duso Site and MHBP Treatment Area

Property Information and Survey Maps

ParcelAccess

Final Roll

Parcel Grid Identification #:
134689-6162-05-042826-0000
Municipality: Poughkeepsie

Parcel Location
33 Fulton St

Owner Name on March 1
Star Gas Properties Inc , *(P)*

Primary *(P)* Owner Mail Address
33 Fulton St
Poughkeepsie NY 126010000

Parcel Details

Size (acres):	.7 Ac	Land Use Class:	(441) Commercial: Storage, Warehouse and Distribution Facilities: Gasoline, Fuel, Oil, Liquid Petroleum Storage and or Distribution
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(133201) Hyde Park Central School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$155500	$429000	$429000	$429000	$429000	$0

.

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 429000

.

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	0	1984	0657	( )	0

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(3) Comm/public	(3) Comm/public	(3) Normal	FC	(F06) Nat gas dstr

.

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1915	1	3200	(0832) 1 sty warehouse wood mill	(2) Average +

.

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	0

.

Number Identical:	Condition Code:
1	3

.

Site Number: 1
Bldg Sec.: 1 Bldg. Number: 2

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1915	1	1470	(0312) 1 sty store load sup	(2) Average

.

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
100	0	0	0	0

.

Number Identical:	Condition Code:
1	3

.

Site Number: 1
Bldg Sec.: 1 Bldg. Number: 3

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1965	1	3240	(0832) 1 sty warehouse wood mill	(2) Average

.

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	0

.

Number Identical:	Condition Code:
1	3

.

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (F06) Nat gas dstr

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	4990	0	0	0

.

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

.

Improvements:
Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RG4) Gar-1.0 det	0	0	1	1950

.

Condition:	Grade	Sq. Ft.
(3) Normal	C	150

.

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(FC3) Shed-galvnzd	0	0	1	1950

.

Condition:	Grade	Sq. Ft.
(3) Normal	C	285

.

Site Number: 1
Improvement Number: 3

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(FC3) Shed-galvnzd	0	0	1	1950

.

Condition:	Grade	Sq. Ft.
(3) Normal	C	240

.

Site Number: 1
Improvement Number: 4

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(FC3) Shed-galvnzd	0	0	1	1950

.

Condition:	Grade	Sq. Ft.
(3) Normal	C	144

.

Site Number: 1
Improvement Number: 5

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK6) Tank-hz bulk	0	0	1	1962

.

Condition:	Grade	Sq. Ft.
(3) Normal	C	30000

.

Site Number: 1
Improvement Number: 6

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK6) Tank-hz bulk	0	0	1	1950

.

Condition:	Grade	Sq. Ft.
(3) Normal	C	15000

.

Site Number: 1
Improvement Number: 7

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(LP4) Pavng-asphlt	0	0	1	1985

.

Condition:	Grade	Sq. Ft.
(3) Normal	C	10000

.

Special District Information:

Special District: 999Y2

Spec. Dist. Name:	Primary Units:	Advalorem Value
Townwide Drain Imp	2100	0

.

Special District: CL057

Spec. Dist. Name:	Primary Units:	Advalorem Value
Consolidated Light	0	429000

.

Special District: FF025

Spec. Dist. Name:	Primary Units:	Advalorem Value
Fairview Fire Pok	0	429000

.

Special District: GL000

Spec. Dist. Name:	Primary Units:	Advalorem Value
Pok Lib District	0	429000

.

Special District: TW0K3

Spec. Dist. Name:	Primary Units:	Advalorem Value
Town Wide Wat Imp	3500	0

.

Special District: WS0P4

Spec. Dist. Name:	Primary Units:	Advalorem Value
4th Ward Swr Imp Cap	2800	0

.

ParcelAccess

Final Roll

Parcel Grid Identification #:
134689-6162-05-005836-0000
Municipality: Poughkeepsie

Parcel Location
3440-3444 North Rd

Owner Name on March 1
Midhudson Center LLC , *(P)*

Primary *(P)* Owner Mail Address
1125 Ocean Ave
Lakewood NJ 605229273

Parcel Details

Size (acres):	5.81 Ac (S)	Land Use Class:	(452) Commercial: Retail Services: Area or Neighborhood Shopping Centers
File Map:	10650	Agri. Dist.:	(0)
File Lot #:	3	School District:	(133201) Hyde Park Central School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$1032000	$2400000	$2400000	$2400000	$2400000	$0

.

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 2400000

.

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	0	1957	0612	( )	0

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(3) Comm/public	(3) Comm/public	(3) Normal	FC	(D03) Local center

.

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
2000	1	54700	(0325) Shopping ctr/strip load sup	(2) Average +

.

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	0

.

Number Identical:	Condition Code:
1	3

.

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (D03) Local center

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
(01) Square feet	23942	0	0	0

.

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
1	0	0	0

.
Site Number: 1
Use Number: 2
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	30758	0	0	0

.

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

.

Special District Information:
Special District: 999Y2

Spec. Dist. Name:	Primary Units:	Advalorem Value
Townwide Drain Imp	11700	0

.
Special District: CL057

Spec. Dist. Name:	Primary Units:	Advalorem Value
Consolidated Light	0	2400000

.
Special District: FF025

Spec. Dist. Name:	Primary Units:	Advalorem Value
Fairview Fire Pok	0	2400000

.
Special District: GL000

Spec. Dist. Name:	Primary Units:	Advalorem Value
Pok Lib District	0	2400000

.
Special District: TW0K3

Spec. Dist. Name:	Primary Units:	Advalorem Value
Town Wide Wat Imp	20200	0

.
Special District: WS0P4

Spec. Dist. Name:	Primary Units:	Advalorem Value
4th Ward Swr Imp Cap	16200	0

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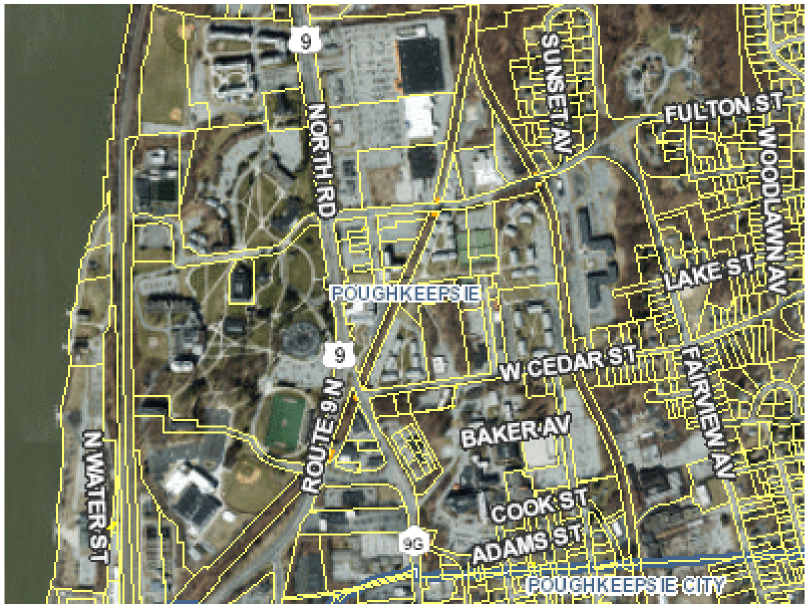
ParcelAccess



Final Roll

Parcel Grid Identification #:
134689-6162-05-011773-0000
Municipality: Poughkeepsie

Parcel Location
Spur N & E Of City

Owner Name on March 1
County of Dutchess , *(P)*

Primary *(P)* Owner Mail Address
626 Dutchess Tpke
Poughkeepsie NY 12603

Parcel Details

Size (acres):	11.5 Ac (C)	Land Use Class:	(340) Vacant Land Located in Industrial Areas
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(133201) Hyde Park Central School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$367100	$367100	$0	$0	$0	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	8	100	$ 367100

Tent. Roll:	Final. Roll:	Valuation:
5/1/2021	7/1/2021	7/1/2020

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$3168100	12/11/2019 2:44:17 PM	22019	8080	(D)	5

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(1) None	(1) None	(1) Inferior	FC	( )

Special District Information:

Special District: 999Y2

Spec. Dist. Name:	Primary Units:	Advalorem Value
Townwide Drain Imp	9300	0

Special District: CL057

Spec. Dist. Name:	Primary Units:	Advalorem Value
Consolidated Light	0	0

Special District: FF025

Spec. Dist. Name:	Primary Units:	Advalorem Value
Fairview Fire Pok	0	0

Special District: GL000

Spec. Dist. Name:	Primary Units:	Advalorem Value
Pok Lib District	0	0

.

Special District: TW0K3

Spec. Dist. Name:	Primary Units:	Advalorem Value
Town Wide Wat Imp	4800	0

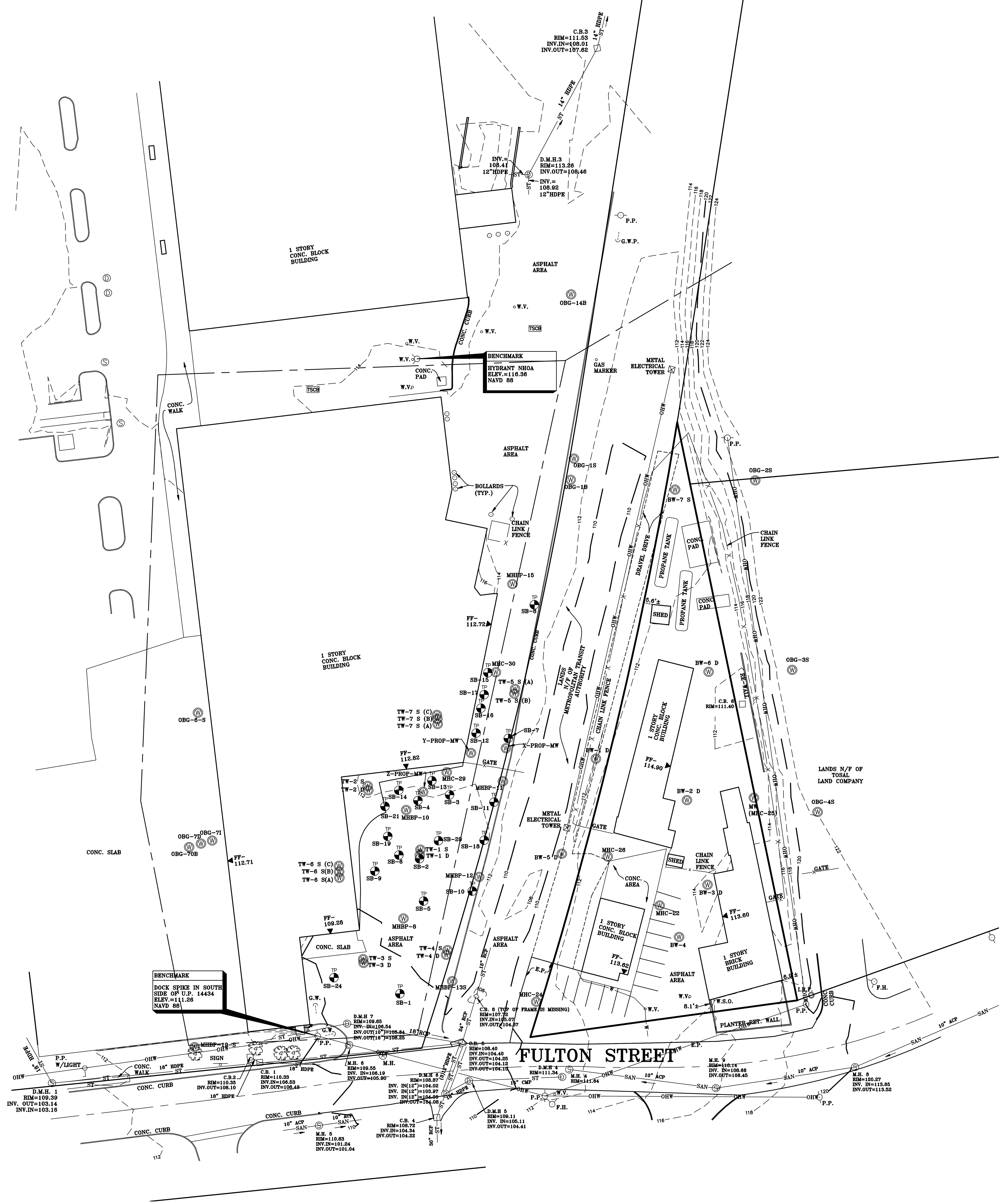
.

Exemption Information:

Exemption: 13100

Name:	Amount:
County Owned	$367100

.



2011 SURVEY

MONITORING WELLS

DESCRIPTION	NORTHING	EASTING	ELEVATION (TOP OF PVC)
OBG-8S	1053381.4881	647922.5526	109.93
MHBP-8	1053413.4385	647974.5961	110.57
MHBP-13S	1053372.0020	648006.7151	110.58
MHBP-12	1053440.8841	648024.5695	111.63
MHBP-10	1053485.0607	647976.3233	111.50
MHC-29	1053510.1269	648003.1976	112.51
MHBP-11	1053504.0934	648040.2486	112.06
MHC-30	1053576.1191	648035.5049	112.57
MHBP-15	1053634.3952	648046.5524	112.74
OBG-1B	1053703.3418	648084.8323	114.56
OBG-1S	1053717.6545	648087.2883	115.39
OBG-14B	1053825.8566	648085.1967	112.61
OBG-6S	1053549.4043	647838.9091	112.89
OBG-7S	1053462.8862	647840.8464	112.82
OBG-7I	1053464.9378	647848.3024	112.88
OBG-7D	1053462.8862	647840.8464	112.82
OBG-70B	1053460.6042	647833.0427	112.81
MHBP-19S	1053328.3524	647836.7092	111.57
MHC-24	1053358.4086	648062.2841	111.58
MHC-26	1053454.3302	648109.4082	112.37
MHC-22	1053422.0392	648143.7675	113.03
OBG-4S	1053483.8113	648248.0624	122.17
OBG-3S	1053577.7149	648231.2600	123.83
OBG-2S	1053702.9314	648206.8199	123.19
X-PROP-MW	1053525.9273	648042.2405	112.35
Y-PROP-MW	1053522.7786	648019.1841	112.56
Z-PROP-MW	1053497.1209	647987.5308	112.01

BORINGS

DESCRIPTION	NORTHING	EASTING	ELEVATION (GROUND)
SB-1	1053363.6536	647972.2189	109.43
SB-2	1053452.9144	647985.1859	111.12
SB-3	1053495.0640	648005.0530	112.06
SB-4	1053491.3418	647984.0902	111.77
SB-5	1053424.9147	647987.8434	110.90
SB-6	1053455.3281	647971.5379	111.07
SB-7	1053532.4186	648043.7719	112.42
SB-8	1053620.7211	648060.9936	112.73
SB-9	1053444.6647	647955.7024	110.78
SB-10	1053431.5361	648019.9859	111.73
SB-11	1053490.2672	648034.3506	112.21
SB-12	1053535.9484	648022.5167	112.59
SB-13	1053504.3815	647993.3397	112.25
SB-14	1053498.0781	647971.4937	111.97
SB-15	1053575.8314	648030.3247	112.65
SB-16	1053552.3584	648025.7023	112.67
SB-17	1053561.3514	648027.8111	112.73
SB-18	1053465.1440	648027.8522	111.96
SB-19	1053467.6736	647964.2039	111.05
SB-20	1053464.7708	647997.6766	111.59
SB-21	1053487.4884	647962.3623	111.33
SB-24	1053374.3389	647928.7029	109.92

2012 SURVEY

MONITORING WELLS

DESCRIPTION	NORTHING	EASTING	ELEVATION (GROUND)	(TOP OF PVC-SHALLOW)	(TOP OF PVC-DEEP)	(TOP OF PVC-INTERMEDIATE)
BW-1 DOUBLE	1053518.9976	648101.6111	112.40	111.99	111.68	(N/A)
BW-2 DOUBLE	1053491.6173	648161.7047	112.44	111.01	111.03	(N/A)
BW-3 DOUBLE	1053435.7047	648175.3011	112.28	111.95	111.93	(N/A)
BW-4 SINGLE	1053401.1602	648156.5441	112.07	112.54	(N/A)	(N/A)
BW-5 DOUBLE	1053456.2283	648079.1408	111.57	111.19	110.93	(N/A)
BW-6 DOUBLE	1053576.4365	648176.0245	112.36	111.93	111.92	(N/A)
BW-7 SINGLE	1053696.8342	648153.8892	111.63	111.21	(N/A)	(N/A)
TW-1 SINGLE	1053458.8648	647985.7147	111.27	(N/A)	(N/A)	110.63
TW-1 DOUBLE	1053455.2106	647985.3597	111.18	110.70	110.35	(N/A)
TW-2 SINGLE	1053500.9715	647950.9314	112.91	112.71	(N/A)	(N/A)
TW-2 DOUBLE	1053498.1469	647951.3706	112.71	112.30	(N/A)	112.31
TW-3 SINGLE	1053386.4677	647947.9943	109.97	109.69	(N/A)	(N/A)
TW-3 DOUBLE	1053384.0116	647948.2640	109.93	109.43	109.35	(N/A)
TW-4 SINGLE	1053392.4961	648003.6557	110.95	110.27	(N/A)	(N/A)
TW-4 DOUBLE	1053389.4368	648002.7303	110.88	110.57	110.39	(N/A)
TW-5 SING.(A)	1053565.1237	648048.2829	112.54	112.14	(N/A)	(N/A)
TW-5 SING.(B)	1053561.9839	648048.6984	112.54	(N/A)	(N/A)	111.99
TW-6 SING.(A)	1053440.3041	647932.2231	108.40	108.03	(N/A)	(N/A)
TW-6 SING.(B)	1053444.2915	647932.0964	108.44	108.17	(N/A)	(N/A)
TW-6 SING.(C)	1053448.2195	647932.0077	108.45	108.27	(N/A)	(N/A)
TW-7 SING.(A)	1053541.9390	647997.1261	112.76	112.44	(N/A)	(N/A)
TW-7 SING.(B)	1053545.2889	647996.9498	112.79	112.57	(N/A)	(N/A)
TW-7 SING.(C)	1053547.9076	647996.6730	112.79	112.58	(N/A)	(N/A)

LEGEND:

- TSCB — TRAFFIC SIGNAL CONTROL BOX
- G.W. — GUY WIRE POLE
- P.P. — UTILITY POLE
- F.H. — FIRE HYDRANT
- P.P. W/ LIGHT — UTILITY POLE WITH LIGHT
- M.H. — UNKNOWN MANHOLE
- FENCE LINE
- IRON PIPE
- BOLLARD
- DECIDUOUS TREE
- C.B. — CATCH BASIN
- MHBP-XX — MON. WELL
- TP SB-XX — SOIL BORING
- M.H. X — SANITARY MANHOLE
- D.M.H. X — DRAINAGE MANHOLE
- OHW — OVERHEAD WIRE
- F.F. — FINISHED FLOOR ELEVATION

UNAUTHORIZED ADDITION OR ALTERATION TO THIS MAP IS A VIOLATION OF ARTICLE 145, SECTION 7209, SUB-PARAGRAPH 2 OF NEW YORK STATE EDUCATION LAW.

Revision	Date
REVISED WELL MHC-26 ELEV.	2/1/2013
ADDITIONAL WELL LOCATION	12/18/2012

TOPOGRAPHICAL SURVEY MAP OF LANDS OF NYSDEC (FORMER DUSO CHEMICAL)

(33 FULTON STREET)

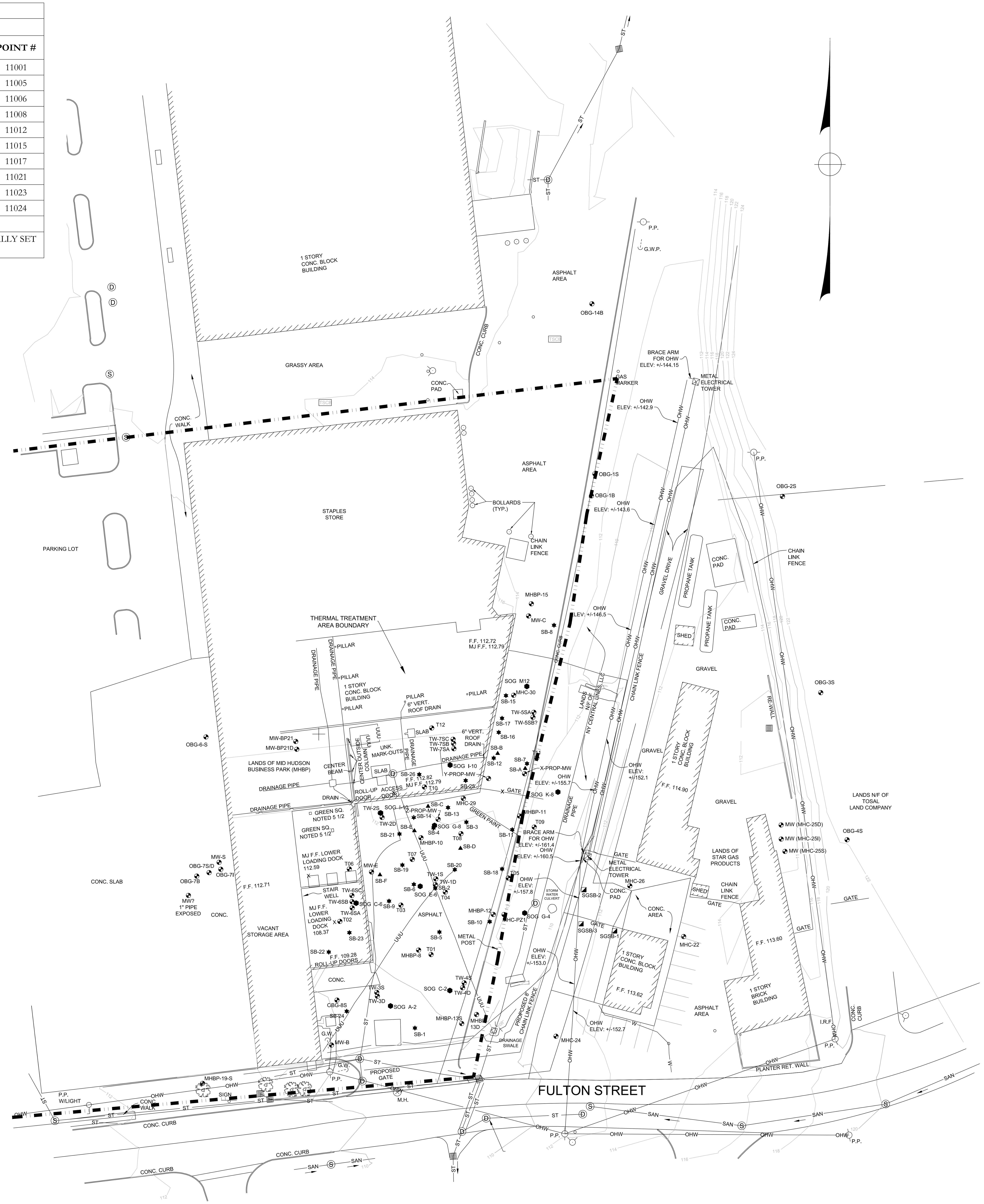
CITY OF POUGHKEEPSIE	DUTCHESS COUNTY, N.Y.
SCALE : 1" = 40'	AUGUST 16, 2011
JOB NO. : 5D-316-11	FULTON-DUSO.DWG

SYK
S.Y. KIM LAND SURVEYOR, P.C.
592 NEW LOUDON ROAD, LATHAM, N.Y. 12110
PHONE : (518) 785-3969 FAX: (518) 785-1608

SOG				
	February-2016			
TMW/VMP	NORTHING	EASTING	COUPLING ELEV	POINT #
SOG C-6	1053443.371	647934.72	111.01	11001
SOG I-10	1053531.495	647994.684	116.42	11005
SOG M-12	1053581.699	648043.669	115.48	11006
SOG K-8	1053514.299	648063.504	114.58	11008
SOG G-4	1053437.066	648042.275	114.41	11012
SOG C-2	1053387.604	647994.515	113.78	11015
SOG A-2	1053377.757	647956.648	112.82	11017
SOG E-6	1053454.116	647975.595	114.22	11021
SOG F-9	1053500.93	647950.405	115.81	11023
SOG G-8	1053492.946	647984.722	114.98	11024
	SITE DATUM SUPPLIED BY OTHERS			
ELEVATION TAKEN AT TOP COUPLING ON TOP OF VERTICALLY SET PIPE (FIBERGLASS)				

LEGEND

- APPROXIMATE SITE BOUNDARY
- SURVEYED PROPERTY BOUNDARY
- TSCB TRAFFIC SIGNAL CONTROL BOX
- G.W. GUY WIRE POLE
- P.P. UTILITY POLE
- F.H. FIRE HYDRANT
- P.P. W/ LIGHT UTILITY POLE WITH LIGHT
- M.H. UNKNOWN MANHOLE
- FENCE LINE
- IRON PIPE
- BOLLARD
- DECIDUOUS TREE
- C.B. CATCH BASIN
- S SANITARY MANHOLE
- D DRAINAGE MANHOLE
- MHBP-XX MON. WELL
- SB-XX SOIL BORING LOCATION
- SB-XX MIP BORING LOCATION
- SGSB-X SG BORING LOCATION
- T-XX TMW/VMP
- SOG-XX SURFACE OFF GAS WELL
- SAN SANITARY SEWER LINE
- W WATER LINE
- ST STORM SEWER LINE
- OHW OVERHEAD WIRE (HIGH VOLTAGE)
- UUU UNKNOWN UNDERGROUND UTILITY



MONITORING WELL LOCATIONS						
April-2015						
MONITORING WELLS	NORTHING	EASTING	GROUND ELEV	RIM ELEV	PVC ELEV	POINT #
OBG-6S	1053549.433	647838.893		112.86		14039
OBG-7B	1053460.605	647833.025		112.83		14038
MW-B	1053352.786	647919.005		110.02		3030
*TW-3S	1053386.413	647947.867		109.97		14006
*TW-3D	1053383.974	647948.213		109.89		14007
MHBP-13D	1053372.290	648011.574		110.72		14042
*TW-4D	1053389.387	648002.710		110.85		14009
*TW-4S	1053392.469	648003.686		110.92		14008
MW-C	1053626.641	648044.818		112.90		1279
MHC-30	1053576.054	648035.269		112.55		14020
*TW-5SA	1053565.136	648048.165		112.56		14010
*TW-5SB	1053561.979	648048.697		112.56		14012
*X-PROP-MW	1053525.935	648042.245		112.39		14021
*Z-PROP-MW	1053496.890	647987.057		112.04		14024
MHBP-10	1053485.080	647976.123		111.50		14017
MHC-PZ1	1053436.093	648029.116		111.54		1568
*TW-1S	1053458.851	647985.596		111.26		14002
*TW-1D	1053455.168	647985.273		111.17		14003
*TW-2S	1053500.892	647950.035		113.12		14004
*TW-2D	1053498.045	647951.275		112.77		14005
MHBP-8	1053413.418	647974.588		110.53		14014
*Y-PROP-MW	1053522.913	648019.195		112.65		14023
*TW-6SA	1053440.242	647932.237		108.40		14026
*TW-6SB	1053444.280	647932.106		108.43		14027
*TW-6SC	1053448.215	647932.004		108.46		14028
*TW-7SA	1053541.941	647997.124		112.75		14030
*TW-7SB	1053545.270	647996.916		112.78		14031
*TW-7SC	1053547.949	647996.627		112.79		14032
MW-D	1053546.537	647896.197		112.79		14033
MW-E	1053463.236	647944.559		111.01		3031
February-2016						
MONITORING WELLS	NORTHING	EASTING	GROUND ELEV	RIM ELEV	PVC ELEV	POINT #
OBG-7S	1053469.405	647847.255	112.80	112.75	112.67	14037
OBG-7I	1053464.987	647848.346	112.78	112.87	112.69	14036
OBG-7D	1053462.838	647840.844	112.80	112.80	112.64	14035
OBG-8S	1053381.371	647922.534	109.92	109.90	109.79	11018
MHBP-13S	1053366.496	648002.101	110.34	110.33	109.63	11014
MHBP-12	1053436.128	648022.265	111.73	111.72	111.35	11013
MHBP-11	1053498.974	648039.01	112.12	112.12	111.58	11010
MHC-29	1053510.836	648008.09	112.38	112.36	111.07	11026
MHBP 21	1053546.536	647896.286	112.82	112.79	112.43	11003
MHBP 21D	1053541.500	647896.884	112.83	112.83	112.60	11004
SITE DATUM SUPPLIED BY OTHERS			*DENOTES ABANDONED WELL			

TMW/ VMP				
February-2016				
TMW/VMP	NORTHING	EASTING	GROUND ELEV	POINT #
TO1	1053410.537	647982.563	110.77	11016
TO2	1053431.725	647924.349	108.46	11000
TO3	1053442.107	647963.321	110.91	11020
TO4	1053450.397	647991.649	111.54	11019
T05	1053459.427	648031.817	112.56	11011
TO6	1053465.147	647930.371	112.60	11002
TO7	1053471.265	647970.584	111.32	11022
TO8	1053487.718	648001.654	112.07	11025
TO9	1053491.906	648048.409	112.79	11009
T10	1053517.469	647978.333	112.73	11028
T11	1053536.089	648050.072	113.08	11007
T12	1053555.152	647982.964	112.83	11027
	SITE DATUM SUPPLIED BY OTHERS			

NOTES

1. THIS PLAN OF EXISTING SITE CONDITIONS WAS DEVELOPED FROM A DIGITAL MAPPING FILE PROVIDED BY SEALAND ENVIRONMENTAL AND ANNOTATED TO INDICATE THAT THE SOURCE OF THE DATA WAS A 2011 TOPOGRAPHIC SURVEY MAP PREPARED BY S.Y. KIM LAND SURVEYOR, P.C. THE DIGITAL MAPPING FILE WAS PREPARED FOR THIS NYSDEC PROJECT AND HAS BEEN FIELD EDITED TO INDICATE IMPROVEMENTS AND UTILITY TONEOUTS MADE SINCE THE DATE OF THE PREVIOUS SURVEY.

0 20 40 80

SCALE IN FEET

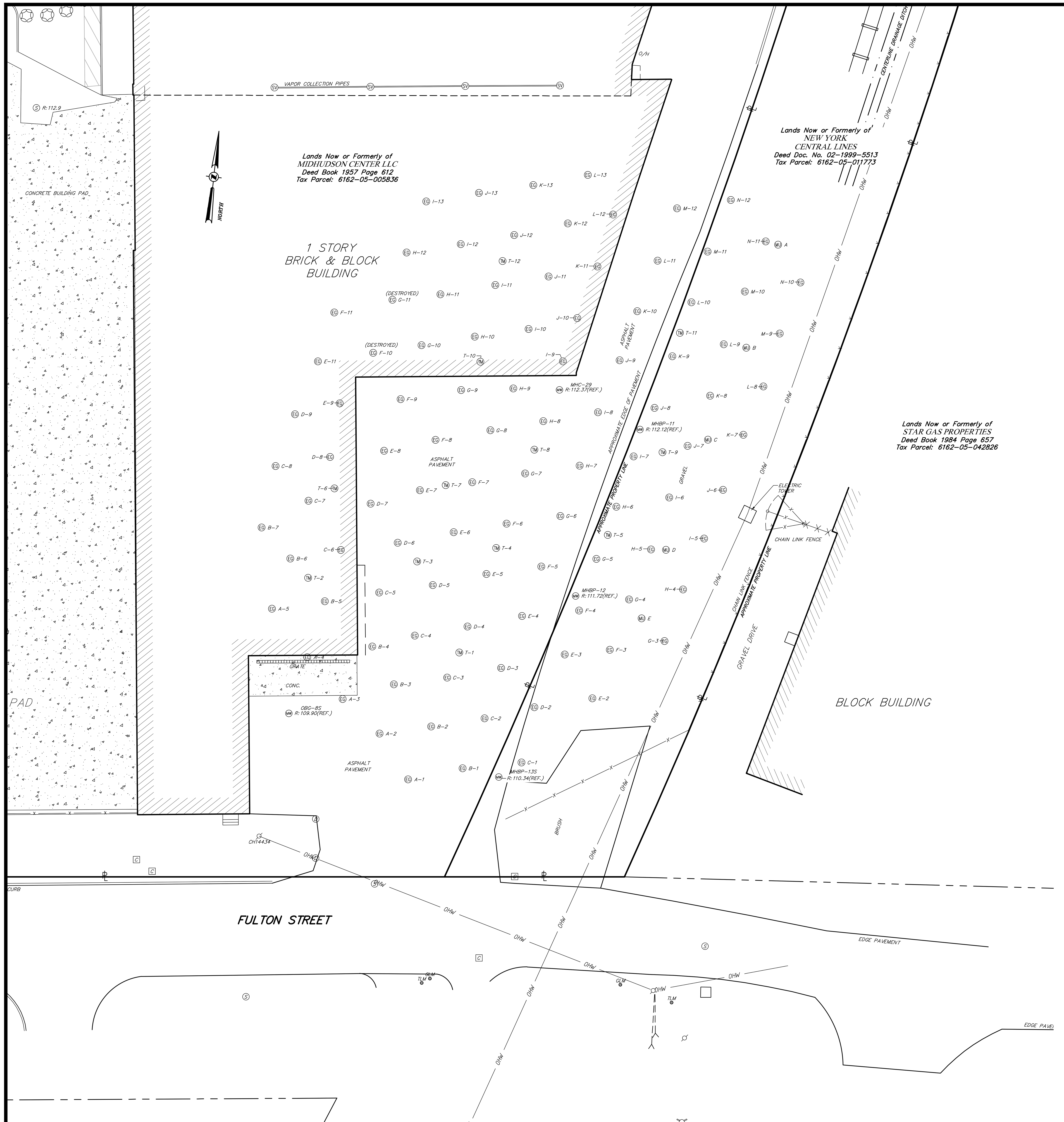
NO	REVISIONS	DRN	CHK	DATE
1	ADDED MONITORING WELL TABLES	DAV	MJF	2/3/16
2	ADDED SOG AND TMP LOCATIONS	JLC		2/10/16

Engineering and Land Surveying, P.C.
1533 Crescent Road - Clifton Park, NY 12065

FORMER DUSO CHEMICAL SITE
33 FULTON STREET,
POUGHKEEPSIE, NY
DUTCHESS COUNTY

EXISTING SITE CONDITIONS

DATE: 07/08/2015
PROJECT NO: MJ755.02
FILENAME: 60279080_27.DWG
SHEET NO: 1
DRAWING NO: 1



WELL TYPE	NORTHING	EASTING	TOP OF CASING EL.	GROUND EL.	PVC EL.	REMARKS (TOC:TOP OF CASING)	POINT NO.
EGW A-1	1053362.25	647969.18	109.55	109.37		TOC A1 , DAMAGED	2169
EGW A-2	1053377.76	647956.90	112.38	109.63		TOC A2	2146
EGW A-3	1053388.85	647942.03	112.67	109.86		TOC A3	2144
EGW A-4	1053402.62	647927.46	110.76	109.20		TOC A4	2142
EGW A-5	1053418.88	647912.62	111.24	108.54		TOC A-5	2124
EGW B-1	1053368.51	647988.59	112.96	109.96		TOC B1	2171
EGW B-2	1053382.44	647975.41	112.87	109.97		TOC B2	2178
EGW B-3	1053396.32	647960.16	112.43	110.11		TOC B3	2148
EGW B-4	1053409.18	647950.68	112.60	110.28		TOC B4	2150
EGW B-5	1053423.79	647931.55	111.24	108.43		TOC B-5	2123
EGW B-6	1053437.93	647917.26	110.95	110.10	111.217	TOC B-6, DAMAGED	2127
EGW B-7	1053448.07	647905.52	110.36	108.54		TOC B-7	2129
EGW C-1	1053373.04	648009.84	113.56	110.69		TOC C1	2174
EGW C-2	1053387.62	647994.61	112.96	110.70		TOC C2	2176
EGW C-3	1053400.96	647979.24	113.11	110.39		TOC C3	2180
EGW C-4	1053414.92	647965.75	114.14	110.46		TOC C4	2168
EGW C-5	1053429.20	647950.99	113.13	110.60		TOC C5	2152
EGW C-6	1053443.14	647935.31	110.59	108.39		TOC C-6	2122
EGW C-7	1053459.72	647921.52	112.64	100.76		TOC C-7	2131
EGW C-8	1053471.03	647908.08	114.14	112.59		TOC C-8	2132
EGW D-2	1053393.72	648012.24	113.43	111.23		TOC D2	2221
EGW D-3	1053406.62	647998.54	113.16	111.04		TOC D3	2219
EGW D-4	1053420.36	647984.61	110.50	110.82		TOC D4 , DAMAGED	2215
EGW D-5	1053434.09	647970.23	113.51	110.84		TOC D5	2184
EGW D-6	1053448.07	647955.78	113.05	110.83		TOC D6	2154
EGW D-7	1053461.23	647944.27	113.29	110.93		TOC D7	2156
EGW D-8	1053476.58	647927.58	113.48	112.59		TOC D-8 SE WELL	2136
EGW D-9	1053490.74	647913.07	114.34	112.59		TOC D-9	2133
EGW E-11	1053510.96	647919.24	114.15	112.81		TOC E-11	2121
EGW E-2	1053399.29	648033.07	113.78	111.32		TOC E2	2223
EGW E-3	1053414.17	648021.18	114.12	111.75		TOC E3	2225
EGW E-4	1053426.46	648004.02	114.34	111.52		TOC E4	2217
EGW E-5	1053440.31	647989.33	113.79	111.12		TOC E5	2213
EGW E-6	1053454.18	647975.75	113.82	111.08		TOC E6	2186
EGW E-7	1053468.16	647961.68	113.51	110.94		TOC E7	2164
EGW E-8	1053481.06	647947.02	110.46	110.61		TOC E8, DAMAGED	2158
EGW E-9	1053496.52	647928.92	114.51	112.59		TOC E-9	2134
EGW F-10	1053516.00	647939.00		112.81		NEAR F-10, WELL GONE	2077
EGW F-11	1053529.42	647923.22	115.16	112.81		TOC F-11	2120
EGW F-3	1053417.74	648037.40	113.65	111.36		TOC F3	2227
EGW F-4	1053430.80	648024.64	113.61	111.87		TOC F4	2231
EGW F-5	1053445.27	648009.08	114.51	111.83		TOC F5	2239
EGW F-6	1053459.50	647994.62	114.28	111.54		TOC F6	2208
EGW F-7	1053473.17	647980.42	114.28	111.37		TOC F7	2191
EGW F-8	1053487.14	647965.31	113.31	111.38		TOC F8	2162
EGW F-9	1053500.51	647950.94	115.05	112.64		TOC F9	2160
EGW G-10	1053521.03	647956.38	114.55	112.80		TOC G-10	2085
EGW G-11	1053536.00	647943.00		112.81		NEAR G-11, WELL GONE	2075
EGW G-3	1053423.12	648057.01	112.30	110.21		TOC G3	2229
EGW G-4	1053436.87	648042.35	113.50	111.24		TOC G4	2233
EGW G-5	1053450.31	648028.83	114.05	111.94		TOC G5	2235
EGW G-6	1053464.48	648013.92	114.60	111.99		TOC G6	2237
EGW G-7	1053478.50	647999.33	112.53	111.69		TOC G7	2206
EGW G-8	1053492.84	647984.95	114.49	111.78		TOC G8	2196
EGW G-9	1053506.32	647972.65	114.56	112.33		LEANING	2193
EGW H-10	1053526.35	647975.42	112.83	112.81		TOC H-10 , DAMAGED	2086
EGW H-11	1053540.36	647961.18	114.58	112.81		TOC H-11	2074
EGW H-12	1053554.23	647947.16	114.66	112.81		TOC H-12	2108
EGW H-4	1053442.69	648061.68	112.81	110.36		TOC H4	2241
EGW H-5	1053455.97	648048.37	113.77	111.34		TOC H5	2243
EGW H-6	1053470.11	648033.96	114.54	111.92		TOC H6	2248
EGW H-7	1053483.57	648018.93	113.15	112.10		TOC H7	2273
EGW H-8	1053498.33	648003.88	114.69	112.09		TOC H8	2201
EGW H-9	1053509.03	647991.57	114.67	112.43		TOC H9	2198
EGW I-10	1053531.34	647994.73	115.89	112.81		TOC I-10	2087
EGW I-11	1053546.01	647980.80	114.61	112.81		TOC I-11	2073
EGW I-12	1053559.49	647966.54	114.59	112.81		TOC I-12	2107
EGW I-13	1053573.68	647952.23	114.62	112.81		TOC I-13	2114
EGW I-5	1053462.12	648067.24	112.65	110.35		TOC I5	2250
EGW I-6	1053475.67	648052.86	113.61	111.56		TOC I6	2252
EGW I-7	1053489.16	648038.22	114.36	112.02		TOC I7	2254
EGW I-8	1053503.80	648023.44	111.98	112.32		TOC I8 , DAMAGED	2276
EGW I-9	1053520.92	648008.54	113.60	112.39		TOC I-9 , DAMAGED	2097
EGW J-10	1053537.26	648012.04	114.74	112.41		TOC J-10	2092
EGW J-11	1053551.25	647999.84	114.47	112.81		TOC J-11	2072
EGW J-12	1053564.97	647985.64	114.72	112.81		TOC J-12	2106
EGW J-13	1053578.92	647971.09	114.56	112.81		TOC J-13	2115
EGW J-6	1053480.63	648072.13	112.66	110.21		TOC J6	2261
EGW J-7	1053495.21	648057.46	113.66	111.71		TOC J7	2259
EGW J-8	1053507.73	648043.84	113.83	112.17		TOC J8	2277
EGW J-9	1053523.62	648029.17	115.06	112.37		TOC J9	2314
EGW K-10	1053542.25	648033.60	115.10	112.46		TOC K10	2312
EGW K-11	1053556.93	648017.27	114.59	112.81		TOC K-11	2071
EGW K-12	1053571.44	648004.72	114.64	112.81		TOC K-12	2119
EGW K-13	1053583.97	647990.55	114.82	112.81		TOC K-13	2116
EGW K-7	1053501.52	648077.34	113.09	110.39		TOC K7	2263
EGW K-8	1053514.43	648063.59	111.53	111.62		TOC K8, DAMAGED	2280
EGW K-9	1053527.24	648048.26	112.25	112.09		TOC K9, DAMAGED	2289
EGW L-10	1053547.73	648052.97	112.93	112.25		TOC L10	2294
EGW L-11	1053561.48	648039.00	114.98	112.47		TOC L11	2310
EGW L-12	1053576.53	648020.84	114.33	112.81		TOC L-12	2118
EGW L-13	1053589.95	648010.00	114.67	112.81		TOC L-13	2117
EGW L-8	1053519.95	648082.66	112.68	110.30		TOC L8	2281
EGW L-9	1053533.75	648066.47	113.90	111.79		TOC L9, DAMAGED	2287
EGW M-10	1053553.82	648072.00	113.32	111.84		TOC M10	2296
EGW M-11	1053566.84	648056.84	114.56	112.42		TOC M11	2306
EGW M-12	1053581.39	648043.91	115.10	112.56		TOC M12	2308
EGW M-9	1053539.89	648086.43	112.66	110.81		TOC M9	2283
EGW N-10	1053559.35	648091.95	112.65	110.35		TOC N10	2298
EGW N-11	1053572.93	648077.59	112.26	111.96		TOC N11, DAMAGED	2302
EGW N-12	1053586.60	648063.18	114.91	112.57		TOC N12	2304
MUV B	1053533.36	648074.85	112.45	111.62		TOC MUV	2285
MUV A	1053572.25	648082.20	112.70	111.84		TOC MUV	2300
MUV C	1053498.32	648064.63	111.64	111.47		TOC MUV	2265
MUV D	1053456.42	648053.83	112.12	111.33		TOC MUV	2268
MUV E	1053430.45	648047.73	111.37	111.16		TOC MUV	2269
TMW T-1	1053410.55	647982.69	113.52	110.60		TOC T1	2182
TMW T-10	1053517.44	647978.48	114.21	112.71		TOP PVC T-10	2103
TMW T-11	1053536.18	648050.07	114.59	112.28	114.591	TOC T11	2291
TMW T-12	1053555.06	647982.45	115.24	112.82		TOP PVC T-12	2104
TMW T-2	1053431.61	647924.55	110.80	108.36		TOC T-2	2125
TMW T-3	1053442.04	647963.59	113.29	110.82		TOC T3	2166
TMW T-4	1053450.16	647991.97	114.10	111.39	114.229	TOC T4	2210
TMW T-5	1053459.58	648032.02	114.25	111.95	114.373	TOC T5	2245
TMW T-6	1053465.21	647930.49	115.31	112.59	115.145	TOC T-6	2137
TMW T-7	1053470.96	647970.76	114.58	111.19	114.623	TOC T7	2188
TMW T-8	1053487.53	648001.89	113.45	111.87	113.539	TOC T8	2203
TMW T-9	1053491.79	648048.49	114.14	112.00	114.223	TOC T9	2256

NOTES

UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

THE LOCATION OF UNDERGROUND IMPROVEMENTS OR ENCROACHMENTS ARE NOT ALWAYS KNOWN AND OFTEN MUST BE ESTIMATED. IF ANY UNDERGROUND IMPROVEMENTS OR ENCROACHMENTS EXIST OR ARE SHOWN, THE IMPROVEMENTS OR ENCROACHMENTS ARE NOT COVERED BY THIS CERTIFICATE.

BUILDINGS SHOWN HEREON SERVED BY UNDERGROUND UTILITIES.

WELLS SHOWN HEREON WERE COMPILED FROM A FIELD SURVEY COMPLETED AUGUST 30, 2017 BY CHAZEN ENGINEERING LAND SURVEYING AND LANDSCAPE ARCHITECTURE CO. D.P.C.. ON EXISTING SITE DATUM NAVD–88.

BOUNDARY LINES SHOWN HEREON ARE APPROXIMATE AND ARE SUBJECT TO WHATEVER STATE OF FACTS THAT AN ACCURATE BOUNDARY SURVEY MAY REVEAL.

SOME OF THE WELLS SHOWN HEREON WERE DAMAGED PRIOR TO AS–BUILT SURVEY, AND ARE INDICATED IN REMARKS COLUMN AS "REMAINS", THE TOP OF THE CASING ELEVATION IS THE HIGHEST POINT OF THE REMAINS OF CASING AVAILABLE AT THE TIME OF THE SURVEY.

MAP REFERENCE

1. REFERENCE IS HEREBY MADE TO A MAP ENTITLED "EXISTING SITE CONDITIONS, FORMER DUSO CHEMICAL SITE, PROJECT #MJ755.02, FILE NAME 60279080_27.DWG" PREPARED BY MJ ENGINEERING AND SURVEYING P.C. DATED 7/8/2015 LAST REVISED 2/10/2016.
2. REFERENCE IS HEREBY MADE TO A MAP ENTITLED "WELL LAYOUT, DUSO CHEMICAL POUGHKEEPSIE NY, PROJECT #78–0049, FIGURE #2" PREPARED BY CURRENT ENVIRONMENTAL SOLUTIONS DATED 1/28/2015 LAST REVISED 4/9/2015.
3. MAP ENTITLED "ALTA/ASCM LAND TITLE SURVEY PREPARED FOR TFS MID HUDSON LLC" PREPARED BY CHAZEN ENGINEERING AND LAND SURVEYING P.C. DATED 5/20/05

LEGEND:

EXISTING CONDITIONS:

PROPERTY LINE NO PHYSICAL BOUNDS
ADJACENT PROPERTY LINE
EXISTING BUILDING
CONC. CURB — EXISTING CURB/GUTTER
GRAVEL — EXISTING GRAVEL DRIVEWAY
EXISTING FENCE
OHW — EXISTING OVERHEAD WIRES

SYMBOLS:

EXISTING SANITARY MANHOLE
EXISTING DRAINAGE MANHOLE
EXISTING CATCH BASIN
EXISTING GUY WIRE
EXISTING UTILITY POLE
EXISTING LIGHT POLE
EXISTING GAS LINE MARKER
EXISTING HYDRANT
EXISTING TELEPHONE LINE MARKER
EXISTING MONITORING WELL
EXISTING ELECTRO–GRID WELL (EGW)
EXISTING TEMPERATURE MONITORING WELL (TMV
EXISTING SSDS VENT (SSDSV)
EXISTING MAKE–UP VENT (MV)

0 1 2 3
ORIGINAL SCALE IN INCHES

CHAZEN ENGINEERING, LAND SURVEYING & LANDSCAPE ARCHITECTURE, CO., D.P.C.

THE Chazen COMPANIES
Proud to be Employee Owned
Civil Engineers
Land Surveyors
Planners
Environmental & Safety Professionals
Landscape Architects
Transportation Planners & Engineers

Office Locations:

☒ Hudson Valley Office:
21 Fox Street
Poughkeepsie, New York 12601
Phone: (845) 454–3980

☐ Capital District Office:
547 River Street
Troy, New York 12180
Phone: (518) 273–0055

Tennessee Office:
1705 Division Street
Nashville, Tennessee 37203
Phone: (615) 953–4909

☐ North Country Office:
375 Bay Road
Queensbury, New York 12804
Phone: (518) 812–0513

☐ Central NY Office:
721 East Genesee Street
Syracuse, New York 13210
Phone: (315) 251–1013

☐ Westchester NY Office:
235 Main Street, Suite 400
White Plains, New York 10601
Phone: (914) 997–8510

rev.	date	description

FORMER DUSO CHEMICALS SITE - 3440-3444 NORTH ROAD

MAP OF WELL LOCATION PREPARED FOR DUSO CHEMICAL

TOWN OF POUGHKEEPSIE, DUCTHESS COUTY, NEW YORK

designed	checked
AJF	SJA
date 9/13/17	scale 1"=20'
project no. 41516.00	
sheet no. SV1	

Drawing Name: Z:\projects\41500–41599\41516.00 SEC–DUSO\SVY\dwg\05_SVY_41516–00–ASBUILT.dwg
Xref's Attached: XBASE–SVY_41516–00
Date Printed: Sep 13, 2017, 1:46pm

Appendix B

Property Meters and Bounds and Deed

Restriction/Environmental Easement

CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.

Dutchess County Office:

PO Box 3479, 229B Page Park, Manchester Road
Poughkeepsie, NY 12603
Phone: (914) 454-3980 Fax: (914) 454-4020

Orange County Office:
Phone: (914) 457-1521

Capital District Office:
Phone: (518) 371-0929

Schedule A

SURVEY DESCRIPTION
PARCEL 8
PREPARED FOR
STARWOOD CERUZZI POUGHKEEPSIE, LLC

All that plot piece or parcel of land situate and being in the Town of Poughkeepsie, County of Dutchess and State of New York, bounded and described as follows:

BEGINNING at a point at the northerly side of Fulton Street, said point being the southeasterly corner of the herein described parcel said point being the southeasterly corner of lands now or formerly of Arthur H. Bienenstock, thence along the northerly side of Fulton Street S 83°43'10" W 476.86 feet to a point; thence through lands now or formerly of Bienenestock, N 6°42'00" W 444.20 feet and N 83°18'00" E 644.13 feet to a point at the westerly side of lands of Metropolitan Transit Authority (MTA); thence along lands of MTA, S 9°21'00" W 18.17 feet, and southwesterly on a non-tangent curve to the right of radius 2831.90 feet an arc length of 460.31 feet having a chord bearing S 13°57'50" W 459.80 feet to the point or place of beginning.

CONTAINING 5.81 ACRES OF LAND

May 3, 1998

CLERK'S NOTE - VARIATION IN TYPE OR OTHER MATERIAL SAME AS IN ORIGINAL

X:\8\9\SURVEY\docs\...doc

** TOTAL PAGE.02 **

05/14/98 13:26 FAX 1 203 222 1663 STARWOOD CERUZZI LLC 002

CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.

DECLARATION of COVENANTS and RESTRICTIONS

THIS COVENANT is made the ___ day of _______________ 20__, by Enter Owner Name, Choose Owner Type Enter individuals address or State of incorporation and having an office for the transaction of business at Enter address or "same".

WHEREAS, Enter Site Name is the subject of a remedial program performed by the New York State Department of Environmental Conservation (the "Department") , namely that parcel of real property located on Enter Street Address in the Choose Municipality Type of Enter Town/Village/City Name, County of Enter County Name, State of New York, which is part of lands conveyed by Enter Previous Owner's Name to Enter Current Owner's Name by deed dated Enter Deed Date and recorded in the Enter County Name or Leave Blank for NYC Deeds Select Recording Office in Choose an Instrument Type Enter Instrument # or Liber and Page #s, and being more particularly described in Appendix "A," attached to this declaration and made a part hereof, and hereinafter referred to as "the Property"; and

WHEREAS, the Department approved a remedy to eliminate or mitigate all significant threats to the environment presented by the contamination disposed at the Property and such remedy requires that the Property be subject to restrictive covenants.

NOW, THEREFORE, Enter Owner's Name, for itself and its successors and/or assigns, covenants that:

First, the Property subject to this Declaration of Covenants and Restrictions is as shown on a map attached to this declaration as Appendix "B" and made a part hereof.

Second, unless prior written approval by the Department or, if the Department shall no longer exist, any New York State agency or agencies subsequently created to protect the environment of the State and the health of the State's citizens, hereinafter referred to as "the Relevant Agency," is first obtained, where contamination remains at the Property subject to the provisions of the Site Management Plan ("SMP"), there shall be no construction, use or occupancy of the Property that results in the disturbance or excavation of the Property which threatens the integrity of the engineering controls or which results in unacceptable human exposure to contaminated soils.

Third, the owner of the Property shall not disturb, remove, or otherwise interfere with the installation, use, operation, and maintenance of engineering controls required for the Remedy, which are described in the SMP, unless in each instance the owner first obtains a written waiver of such prohibition from the Department or Relevant Agency.

Fourth, the owner of the Property shall prohibit the Property from ever being used for purposes other than for Choose Land Use If current land use is selected, enter current use without the express written waiver of such prohibition by the Department or Relevant Agency.

Fifth, the owner of the Property shall prohibit the use of the groundwater underlying the Property without treatment to render it safe for drinking water or for industrial purposes, as appropriate, and the user must first notify and obtain written approval to do so from the Department or Relevant Agency.

Sixth, the owner of the Property shall provide a periodic certification, prepared and submitted by a professional engineer or environmental professional acceptable to the Department or Relevant Agency, which will certify that the institutional and engineering controls put in place are unchanged from the previous certification, comply with the SMP, and have not been impaired.

Seventh, the owner of the Property shall continue in full force and effect any institutional and engineering controls required for the Remedy and maintain such controls, unless the owner first obtains permission to discontinue such controls from the Department or Relevant Agency, in compliance with the approved SMP, which is incorporated and made enforceable hereto, subject to modifications as approved by the Department or Relevant Agency.

Eighth, this Declaration is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Property, and shall provide that the owner and its successors and assigns consent to enforcement by the Department or Relevant Agency of the prohibitions and restrictions that the Department or Relevant Agency requires to be recorded, and the owner and its successors and assigns hereby covenant not to contest the authority of the Department or Relevant Agency to seek enforcement.

Ninth, any deed of conveyance of the Property, or any portion thereof, shall recite, unless the Department or Relevant Agency has consented to the termination of such covenants and restrictions, that said conveyance is subject to this Declaration of Covenants and Restrictions.

IN WITNESS WHEREOF, the undersigned has executed this instrument the day written below.

By: ______________________________________

Print Name: _______________________________

Title:____________________ Date:_____________

STATE OF NEW YORK)

) s.s.:

COUNTY OF)

On the _______ day of _____________, in the year 201_, before me, the undersigned, personally appeared __________________________, 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.

____

Notary Public State of New York

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

THIS INDENTURE made this _______day of _____________, 20__, between Owner(s) Enter property owner(s) name, having an office at Enter property owner's address, County of Dutchess, State of New York (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 Enter street address of property in the Choose municipality type of Enter property municipality, County of Enter property county and State of New York, known and designated on the tax map of the County Clerk of Enter clerk county as tax map parcel numbers: Section Enter Tax ID Section #. Block Enter Tax ID Block # Lot Enter Tax ID Lot #, being the same as that property conveyed to Grantor by deed dated Enter Deed Date and recorded in the Enter county name or leave blank for NY City deeds County Clerk's Office in Liber and Page Enter Instrument # or Liber and Page #s. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately Enter Acreage +/- acres, and is hereinafter more fully described in the Land Title Survey dated Enter original survey date and, if applicable, "and revised on" and revised survey date prepared by Enter revised surveyor's name or original surveyor's name if not revised, 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 Choose an Oversight Document TypeNumber: Enter SAC# or BCA/Consent Order Index # and “as amended by Amendment(s) #(s)” as applicable, 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:

Choose the allowable land use if current land use is selected, enter current use.

(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 Automatic 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 Choose the correct list of inapplicable uses., 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: Enter DEC Site #
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

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.

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

Enter Grantor's Name:

By: ______________________________________

Print Name: _______________________________

Title:____________________ Date:_____________

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF)

On the _______ day of _________, in the year 20 __, before me, the undersigned, personally appeared ___________________, 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.

____
Notary Public - State of New York

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: ____
Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

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

On the _______ day of _________, in the year 20__, before me, the undersigned, personally appeared Robert W. Schick, 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.

____
Notary Public - State of New York

SCHEDULE "A" PROPERTY DESCRIPTION

Enter Property Description

Notice to Municipality

Date

Name of Official
Name of Municipality
Address
Address

Re: Environmental Easement

Dear Sir or Madam:

Attached please find a copy of an environmental easement granted to the New York State Department of Environmental Conservation ("Department")

on _____________________________,
by _____________________________,
for property at ____,
Tax Map No._____________________,
DEC Site No: _____________________.

This Environmental Easement restricts future use of the above-referenced property to restricted (residential, commercial or industrial) ________________ uses. Any on-site activity must be done in accordance with the Environmental Easement and the Site Management Plan which is incorporated into the Environmental Easement. Department approval is also required prior to any groundwater use.)

Article 71, Section 71-3607 of the New York State Environmental Conservation Law requires that:

> 1. Whenever the department is granted an environmental easement, it shall provide each affected local government with a copy of such easement and shall also provide a copy of any documents modifying or terminating such environmental easement.
>
> 2. Whenever an affected local government receives an application for a building permit or any other application affecting land use or development of land that is subject to an environmental easement and that may relate to or impact such easement, the affected local government shall notify the department and refer such application to the department. The department shall evaluate whether the application is consistent with the environmental easement and shall notify the affected local government of its determination in a timely fashion, considering the time frame for the local government's review of the application. The affected local

government shall not approve the application until it receives approval from the department.

An electronic version of every environmental easement that has been accepted by the Department is available to the public at: http://www.dec.ny.gov/chemical/36045.html. Please forward this notice to your building and/or planning departments, as applicable, to ensure your compliance with these provisions of New York State Environmental Conservation Law. If you have any questions or comments regarding this matter, please do not hesitate to contact me.

Very truly yours,

Appendix C

Excavation Work Plan

1 INTRODUCTION

This Excavation Work Plan (EWP) has been prepared to summarize general requirements related to handling contaminated soil when completing ground-intrusive activities on the Former Duso Chemical Site and Adjacent Mid-Hudson Business Park (the "Site") in areas determined to have the potential for remaining contamination. This EWP is presented as Appendix C to the Site Management Plan (SMP) and has been developed in accordance with the New York State Department of Environmental Conservation (NYSDEC) May 2010 guidance, *DER-10 Technical Guidance for Site Investigation and Remediation* (DER-10) and the NYSDEC *Site Management Plan (SMP) Template*.

2 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the NYSDEC contacts listed in Table 1-2 of the SMP.

This notification will include:

- A detailed 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, estimated volumes of contaminated soil to be excavated, and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for 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 CFR 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix K of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with the required request to import form and all supporting documentation including, but not limited to, chemical testing results.

The NYSDEC project manager will review the notification and may impose additional requirements for the excavation that are not listed in this EWP.

3 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed during all excavations into known or potentially contaminated material (remaining contamination). A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will perform the screening. 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 into material that requires off-site disposal, material that is confirmed clean cover soil, and material that requires testing to determine if the material can be reused on-site as soil beneath a cover 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 Sections 6 through 8 of this appendix.

4 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters, and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. 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.

5 MATERIALS EXCAVATION AND LOAD-OUT

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 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. 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.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck decontamination and/or wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be cleaned of potentially contaminated site soil. If needed, 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.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for 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.

6 MATERIALS TRANSPORT OFF-SITE

All transport of 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.

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.

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.

7 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, 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).

8 MATERIALS REUSE ON-SITE

The qualified environmental professional as defined in 6 NYCRR part 375 will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material (i.e. contaminated) 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. Proposed materials for reuse on-site must be sampled for full suite analytical parameters including per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. The sampling frequency will be in accordance with DER-10 Table 5.4(e)10 unless prior approval is obtained from the NYSDEC project manager for modification of the sampling frequency. The analytical results of soil/fill material testing must meet the site use criteria presented in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed, and the NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances [October 2020 or date of current version, whichever is later] guidance values. Approvals for modifications to the analytical parameters must be obtained from the NYSDEC project manager prior to the sampling event. Soil/fill material for reuse on-site will be segregated and staged as described in Sections 3 and 4 of this EWP. The anticipated size and location of stockpiles will be provided in the 15-day notification to the NYSDEC project manager. Stockpile locations will be based on the location of site excavation activities and proximity to nearby site features. Material reuse on-site will comply with requirements of NYSDEC DER-10 Section 5.4(e)4. Any modifications to the requirements of DER-10 Section 5.4(e)4 must be approved by the NYSDEC project manager. 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.

9 FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to excavation dewatering and decontamination waters, will be handled, transported and disposed of in accordance with applicable local, State, and Federal regulations. Dewatering and decontamination fluids will not be recharged back to the land surface or subsurface of the site, and will be 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 SPDES permit.

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). 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 6 NYCRR 375-6.8. 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.

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.

11 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks 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 barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor 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.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

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 (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), 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.

13 COMMUNITY AIR MONITORING PLAN

Excavation is not currently anticipated for the site, and appropriate community air monitoring will vary widely depending on the scope and location of work. If excavation or other intrusive activities are planned at a later time, a Community Air Monitoring Plan (CAMP) will be developed.

14 ODOR CONTROL PLAN

Excavation is not currently anticipated for the site, and appropriate odor control will vary widely depending on the scope and location of work. If excavation or other intrusive activities are planned at a later time, an Odor Control Plan will be developed.

15 DUST CONTROL PLAN

Excavation is not currently anticipated for the site, and appropriate dust control will vary widely depending on the scope and location of work. If excavation or other intrusive activities are planned at a later time, a Dust Control Plan will be developed.

16 OTHER NUISANCES

Work activity scheduling will comply with local noise ordinances, which specify permitted noises as including construction work, between the hours of 7:00 am and 10:00 pm. Unavoidable work outside of these permitted hours shall not emit noise above reasonable levels when measured 50 feet from the work.

Appendix D
Responsibilities of Owner and Remedial Party

Responsibilities

The responsibilities for implementing the Site Management Plan ("SMP") for the Former Duso Chemical Site and Adjacent Mid-Hudson Business Park site (the "Site"), Number 314103 are divided between the site owner(s) and a Remedial Party, as defined below. The owner(s) is/are currently listed as: Star Gas Properties, Inc., 33 Fulton Street, Poughkeepsie, New York 12601; Midhudson Center LLC, 1125 Ocean Avenue, Lakewood New Jersey 60522; and County of Dutchess, 626 Dutchess Turnpike, Poughkeepsie, New York 12603 (the "owner").

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation ("NYSDEC") is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RP is:

NYSDEC Division of Environmental Remediation, 625 Broadway, Albany, NY 12233-7020

Nothing on this page shall supersede the provisions of an Environmental Easement, Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the site.

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site.

2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all Institutional Controls set forth in a(n) Environmental Easement, Deed Restriction, and/or Environmental Notice remain in place and continue to be complied with. The owner shall provide a written certification (Site Management Plan, Site # 314103), to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC.

3) In the event the site is delisted, the owner remains bound by the Environmental Easement, Deed Restriction, and/or Environmental Notice and shall submit, upon request by the NYSDEC, a written certification that the Environmental Easement, Deed Restriction, and/or Environmental Notice is still in place and has been complied with.

4) The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.

5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. If damage to the remedial components or vandalism is evident, the owner shall notify the site's RP and the NYSDEC in accordance with the timeframes indicated in Section 1.3-Notifications.

6) If some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and the NYSDEC in accordance with the time frame indicated in Section 1.3-Notifications and coordinate the performance of necessary corrective actions with the RP.

7) The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site properties. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership.

Among the notification requirements is the following: Sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 1.3 of the SMP. A change of use includes, but is not limited to, any activity that may increase direct human or environmental exposure (e.g., day care, school or park). A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

8) Until such time as the NYSDEC deems the vapor mitigation system unnecessary, the owner (Star Gas Properties, Inc.) shall operate the system, pay for the utilities for the system's operation, and report any maintenance issues to the RP and the NYSDEC.

9) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site.

2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.

3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.

4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Site Management Plan, Site # 314103 [Engineering Controls]). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html .

6) The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3- Notifications of the SMP.

7) The RP is responsible for the proper maintenance of any installed vapor intrusion mitigation systems associated with the site, as required in Section 5 or Appendix G (Operation, Monitoring and Maintenance Manual) of the SMP.

8) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.

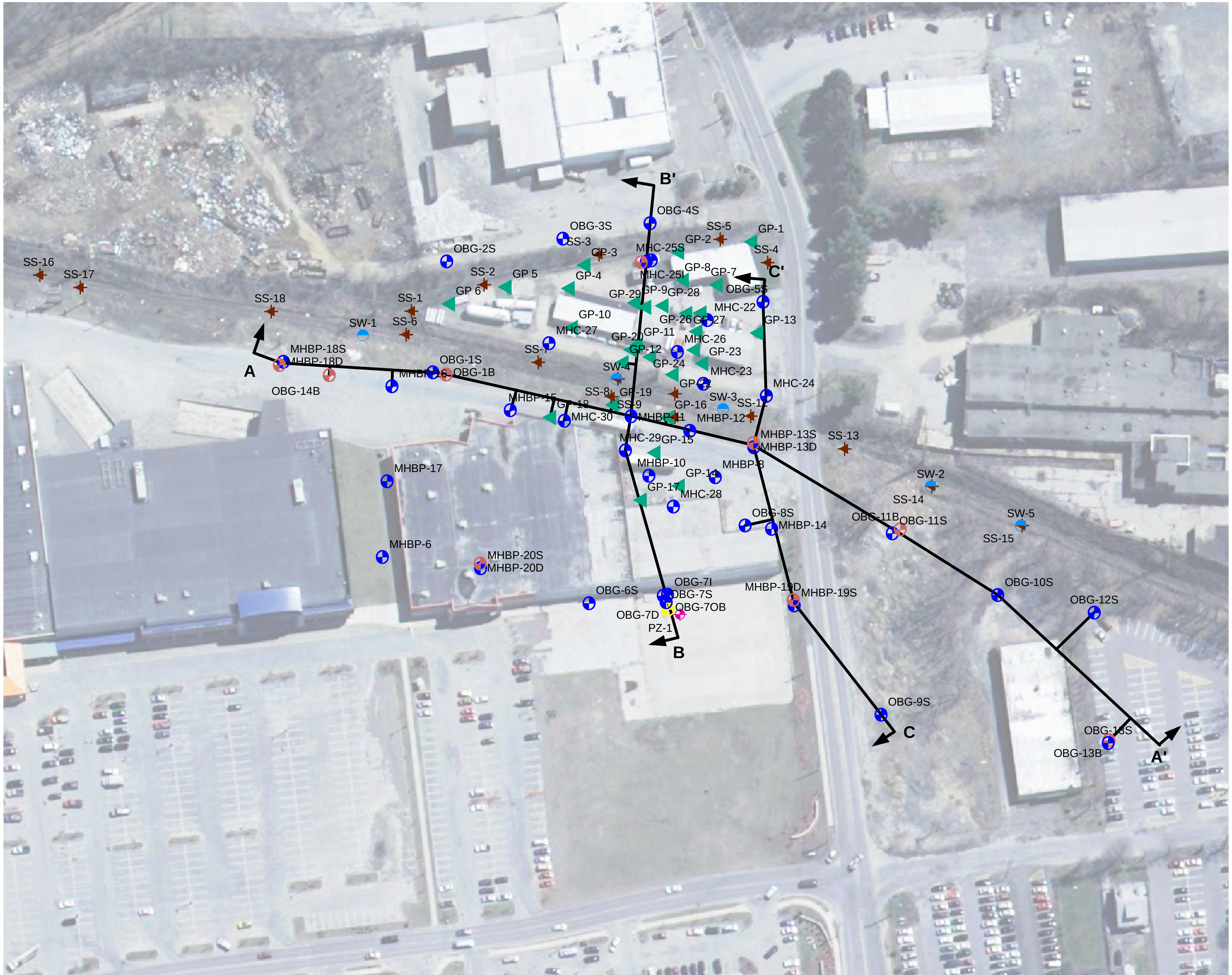
9) Any change in use, change in ownership, change in site classification (e.g., delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the NYSDEC project manager to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

Appendix E

Geologic Cross-Sections



This document was developed in color. Reproduction in B/W may not represent the data as intended.

FIGURE 4

Legend

- Surface Soil Sampling Location
- Subsurface Soil Boring
- Surface Water Sampling Location
- Overburden Well
- Overburden/Bedrock Interface Well
- Bedrock Well
- Piezometer
- Cross Section Locations

NYSDEC
FORMER DUSO CHEMICAL
POUGHKEEPSIE, NY

REMEDIAL INVESTIGATION

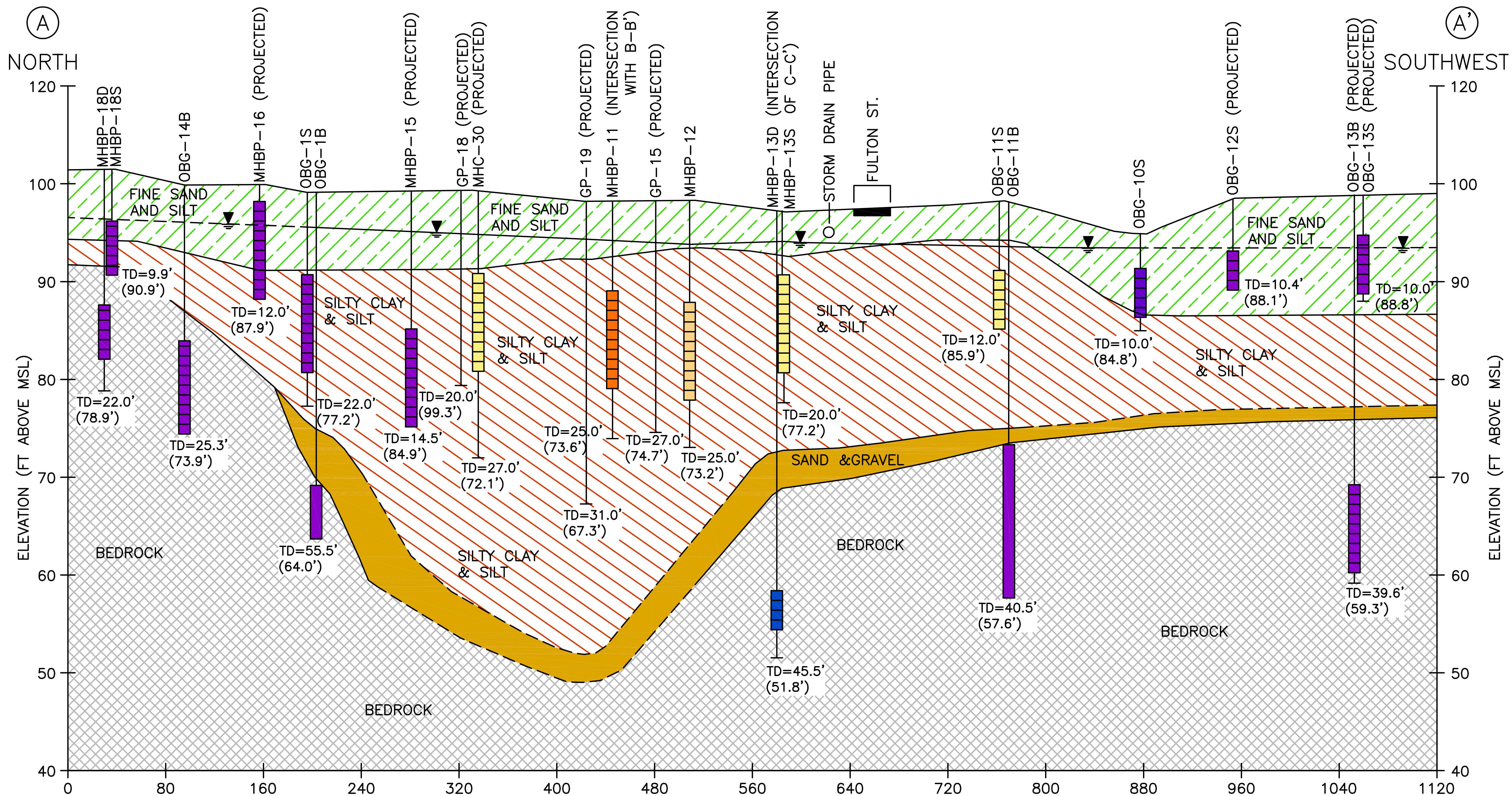
CROSS SECTION LOCATIONS

0 50 100 200
Feet

August 2007
Cross Section Locations.mxd

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 5



OBG-1S ← MONITORING WELL DESCRIPTION
← RISER PIPE
← SCREENED SECTION
← BACKFILLED SECTION OF BORING
TD=45.5' ← TOTAL DEPTH OF BORING (FEET BELOW GRADE)
(51.8') ← ELEVATION (FEET BELOW MEAN SEA LEVEL)

TOTAL DETECTED VOC CONCENTRATIONS IN GROUND WATER AS SHOWN IN WELL SCREEN (MOST RECENT SAMPLING EVENT)

0 ug/L — 200 ug/L

2,000 ug/L — 1,000,000 ug/L

0 10 20
VERTICAL SCALE IN FEET

0 80 160
HORIZONTAL SCALE IN FEET

NEW YORK STATE
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
FORMER DUSO CHEMICAL SITE

CROSS SECTION
(A-A')

FILE NO. 10653.35919.001
AUGUST 2007

O'BRIEN & GERE ENGINEERS INC.

Aug 24, 2007 - 3:59pm

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Aug 24, 2007 – 3:43pm

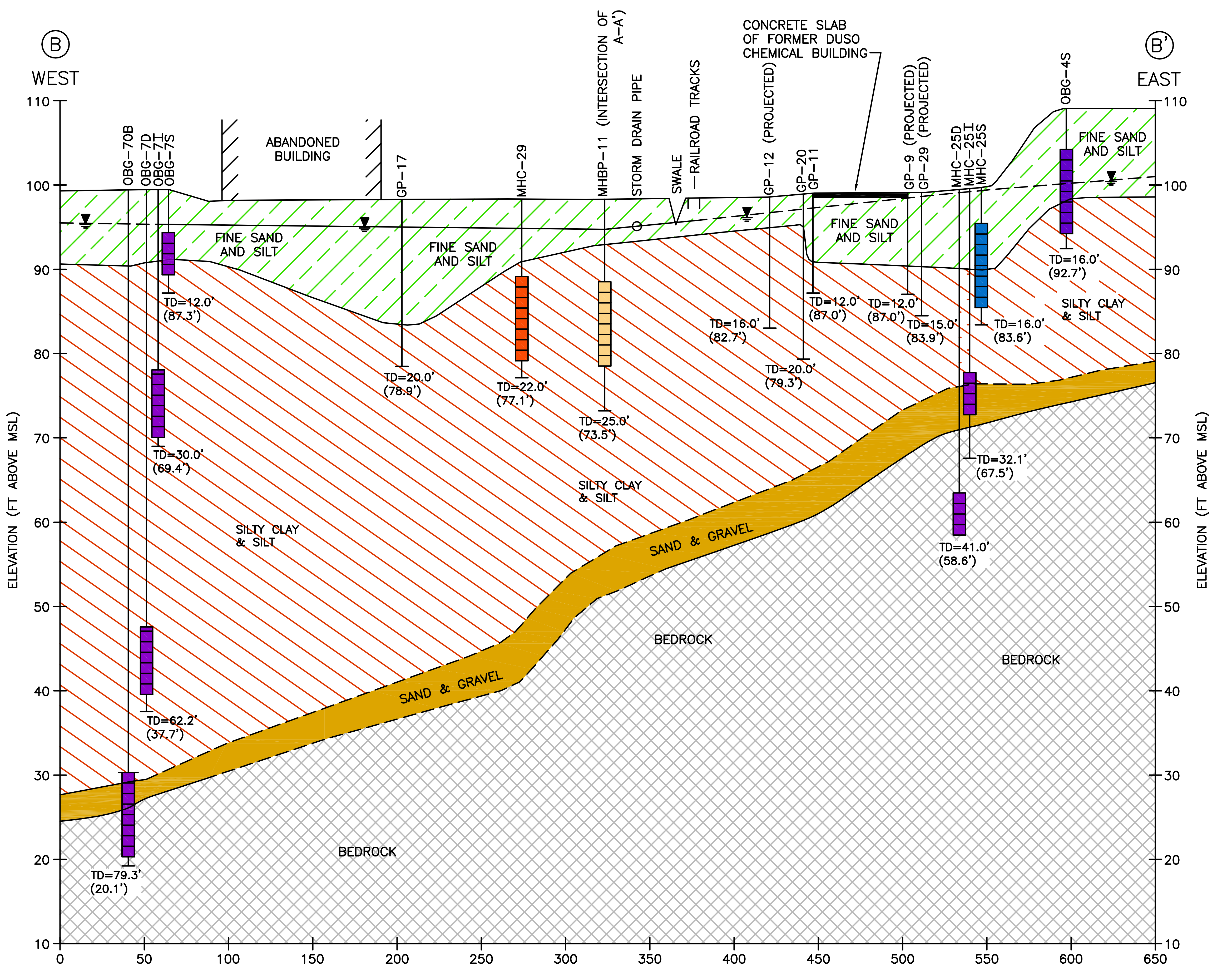

FIGURE 6

LEGEND

OBG-1S — MONITORING WELL DESCRIPTION

RISER PIPE

SCREENED SECTION

BACKFILLED SECTION OF BORING

TD=45.5' — TOTAL DEPTH OF BORING (FEET BELOW GRADE)

(51.8') — ELEVATION (FEET BELOW MEAN SEA LEVEL)

0 ug/L — 100 ug/L

100,000 ug/L — 2,000,000 ug/L

TOTAL DETECTED VOC CONCENTRATIONS IN GROUND WATER AS SHOWN IN WELL SCREEN (MOST RECENT SAMPLING EVENT)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORMER DUSO CHEMICAL SITE CROSS SECTION (B–B')

0 14 28

VERTICAL SCALE IN FEET

0 60 120

HORIZONTAL SCALE IN FEET

FILE NO. 10653.35919.002

AUGUST 2007

O'BRIEN & GERE ENGINEERS INC.

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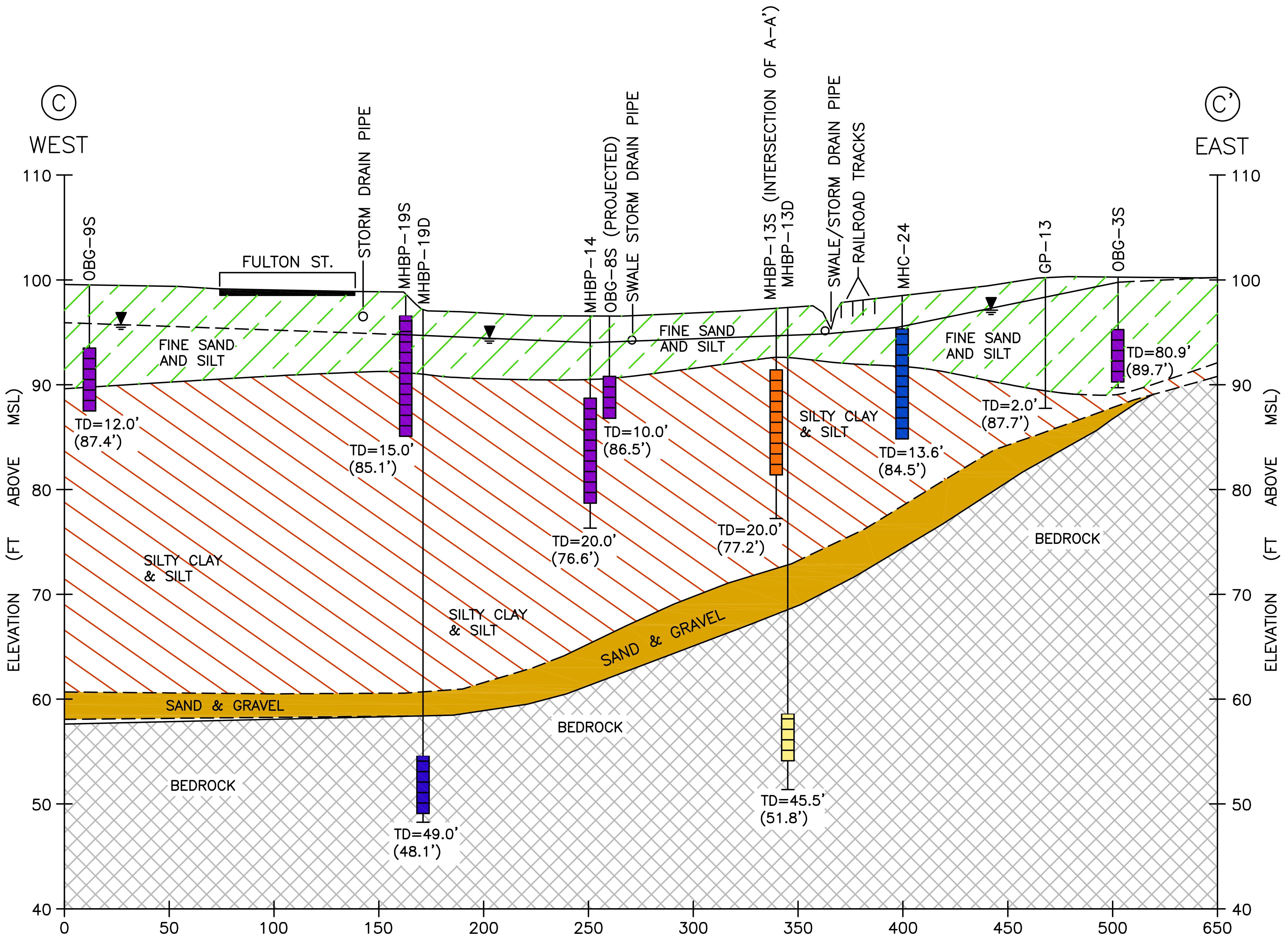

FIGURE 7

LEGEND

OBG-1S — MONITORING WELL DESCRIPTION
RISER PIPE
SCREENED SECTION
BACKFILLED SECTION OF BORING
TD=45.5' — TOTAL DEPTH OF BORING (FEET BELOW GRADE)
(51.8') — ELEVATION (FEET BELOW MEAN SEA LEVEL)

0 ug/L — 50 ug/L

100 ug/L — 10,000 ug/L

TOTAL DETECTED VOC CONCENTRATIONS IN GROUND WATER AS SHOWN IN WELL SCREEN (MOST RECENT SAMPLING EVENT)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORMER DUSO CHEMICAL SITE

CROSS SECTION (C–C')

0 10 20
VERTICAL SCALE IN FEET

0 50 100
HORIZONTAL SCALE IN FEET

FILE NO. 10653.35919.003
AUGUST 2007

O'BRIEN & GERE ENGINEERS INC.

Aug 24, 2007 – 3:52pm
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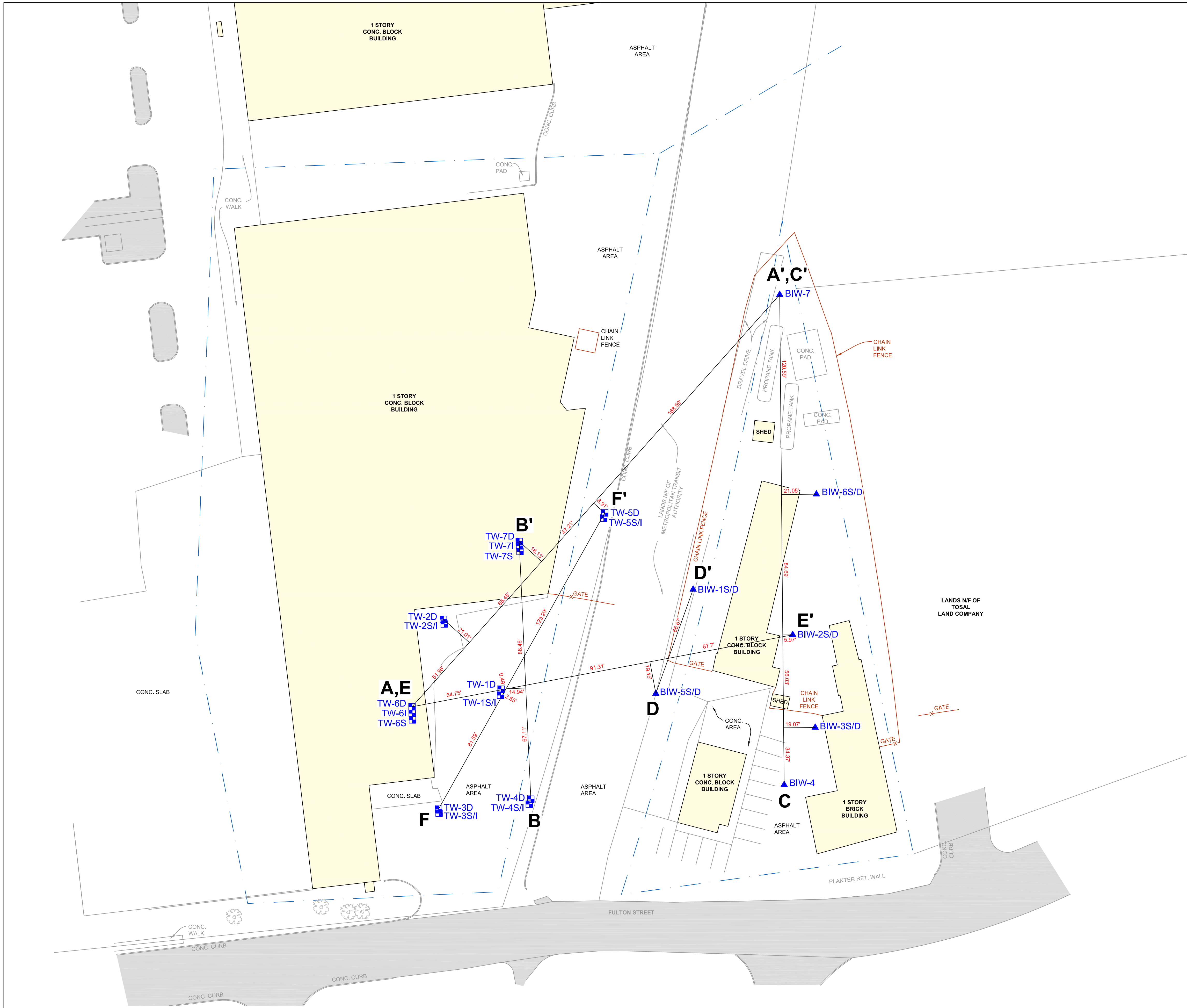

LEGEND

BIW-1S/D ▲	NESTED BIOREMEDIATION INJECTION WELL LOCATION (2012)
TW-5S/I	NESTED THERMAL WELL LOCATION (2012)
	CATCH BASIN
	TREES
	BUILDING
	ROAD / PAVEMENT
A——A'	CROSS-SECTION CUT
	PROPERTY BOUNDARY (APPROXIMATE)
	FENCE (APPROXIMATE)
	PARCEL BOUNDARY

0 25 50 100

SCALE IN FEET

AECOM

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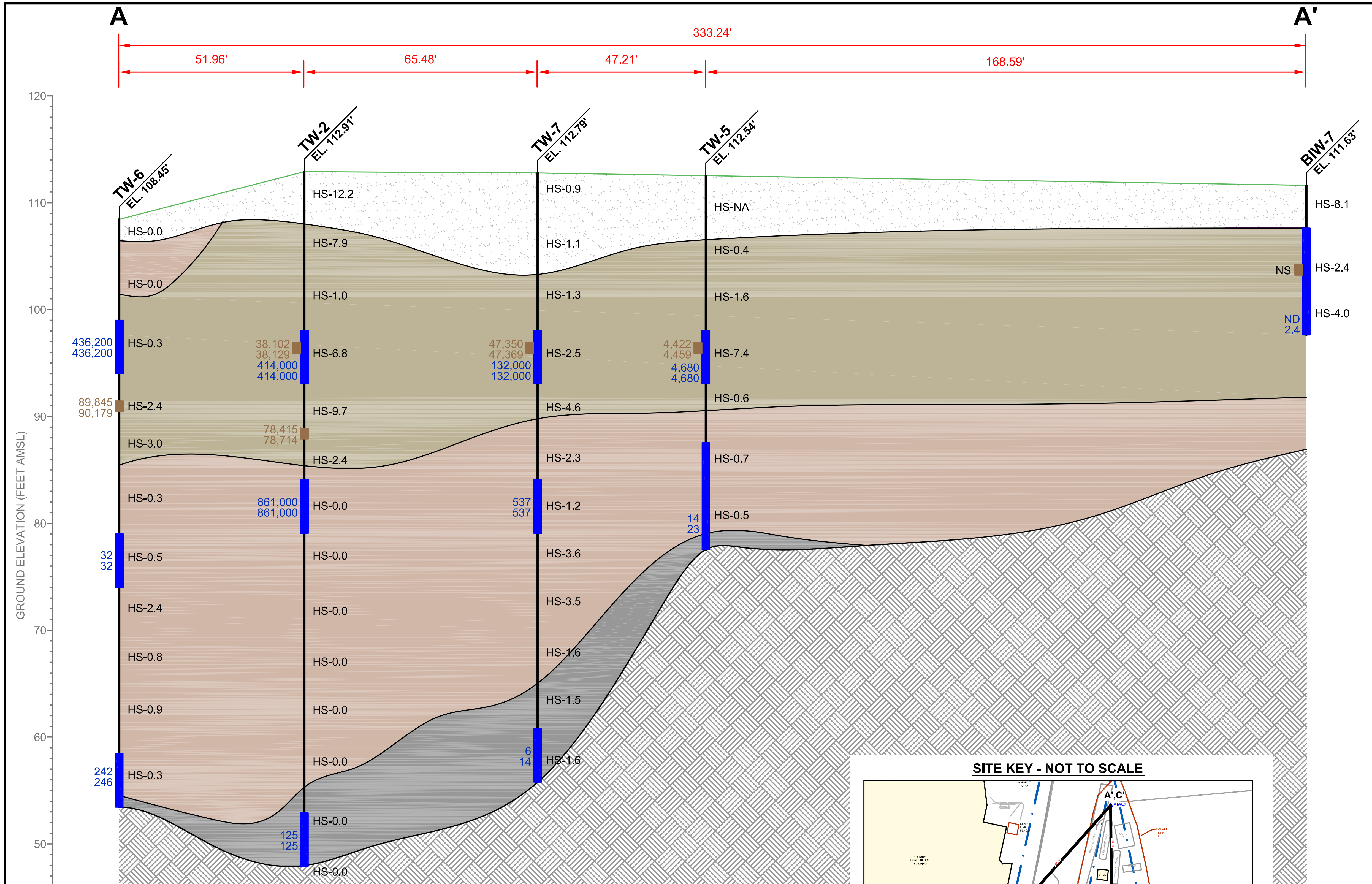
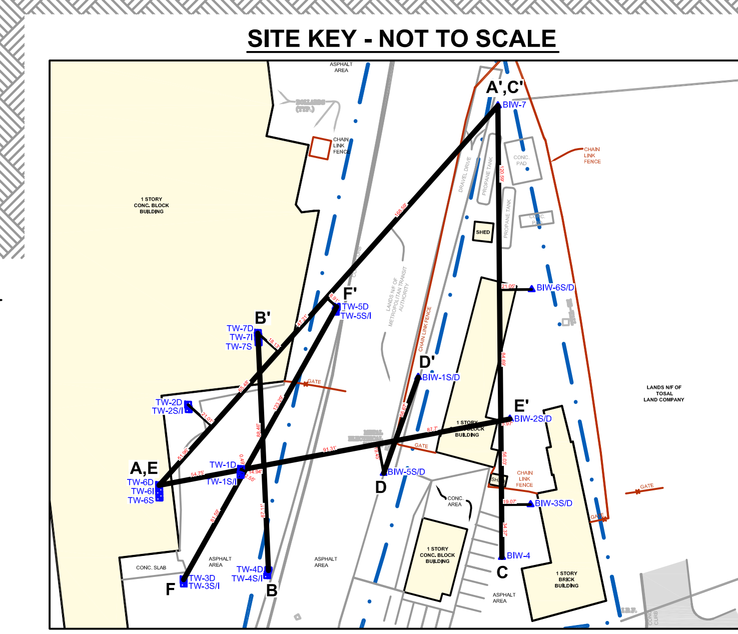
FIGURE A-1
CROSS-SECTION LOCATION MAP

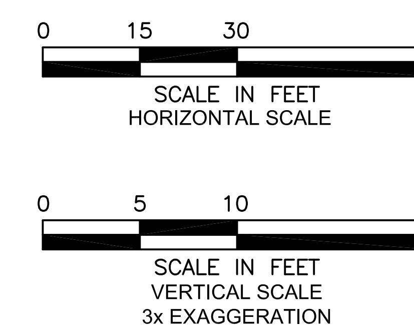
FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

JANUARY 2013 60279080

SOURCE: BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.







LEGEND

WELL	SAND AND GRAVEL
	CLAYEY SILT AND SAND
SCREEN INTERVAL (FT.)	SILTY CLAY
	GLACIAL TILL
SOIL SAMPLE	BEDROCK

89,845 / 90,179 — TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN SOIL / TOTAL VOCS IN SOIL

242 / 246 — TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN GROUNDWATER / TOTAL VOCS IN GROUNDWATER

NOTES

1. NO SOIL SAMPLES WERE COLLECTED ON STAR GAS PROPERTY
2. SOIL RESULTS DISPLAYED IN MICROGRAMS PER KILOGRAM (µg/kg)
3. GROUNDWATER RESULTS DISPLAYED IN MICROGRAMS PER LITER (µg/L)
4. NA - NOT AVAILABLE
5. NS - NOT SAMPLED
6. HS - HEAD SPACE (PARTS PER MILLION [ppm])
7. ND - NON DETECT

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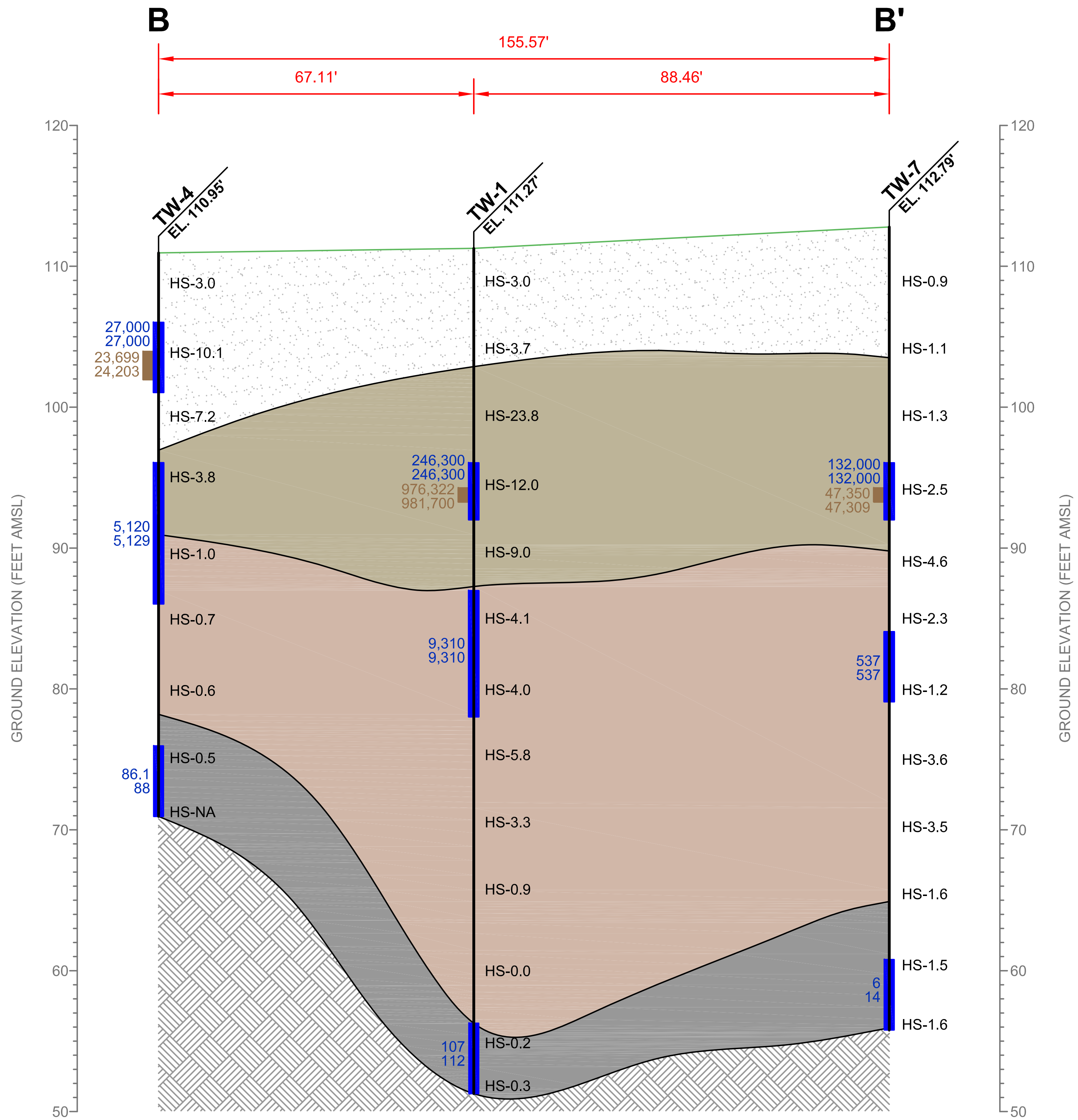
APPENDIX B-1
CROSS-SECTION A-A'

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2013 60279080



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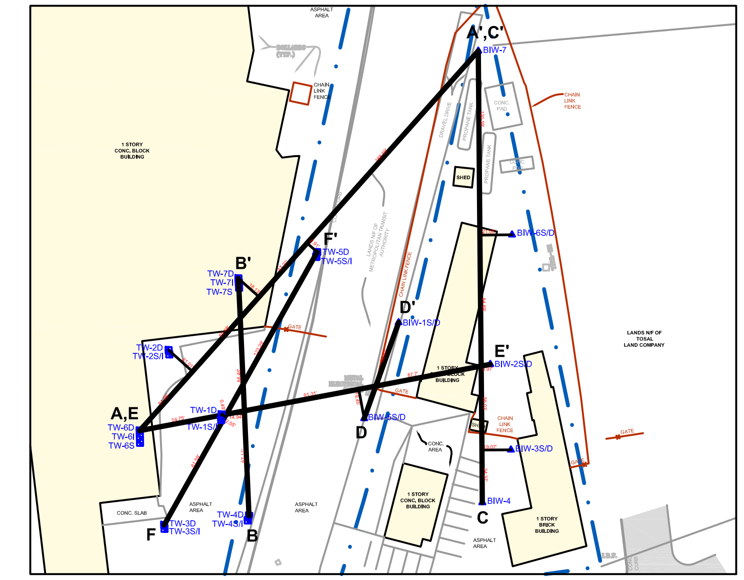

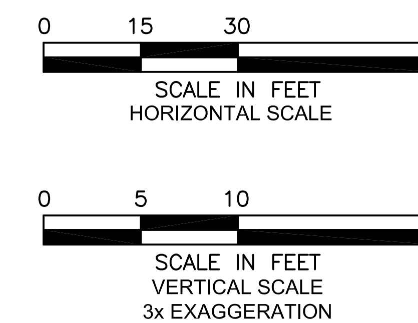

LEGEND

- WELL
- SCREEN INTERVAL (FT.)
- SOIL SAMPLE
- 23,699 / 24,203 — TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN SOIL / TOTAL VOCS IN SOIL
- 86.1 / 88 — TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN GROUNDWATER / TOTAL VOCS IN GROUNDWATER
- SAND AND GRAVEL
- CLAYEY SILT AND SAND
- SILTY CLAY
- GLACIAL TILL
- BEDROCK

NOTES

1. NO SOIL SAMPLES WERE COLLECTED ON STAR GAS PROPERTY
2. SOIL RESULTS DISPLAYED IN MICROGRAMS PER KILOGRAM (µg/kg)
3. GROUNDWATER RESULTS DISPLAYED IN MICROGRAMS PER LITER (µg/L)
4. NA - NOT AVAILABLE
5. NS - NOT SAMPLED
6. HS - HEAD SPACE (PARTS PER MILLION [ppm])
7. ND - NON DETECT

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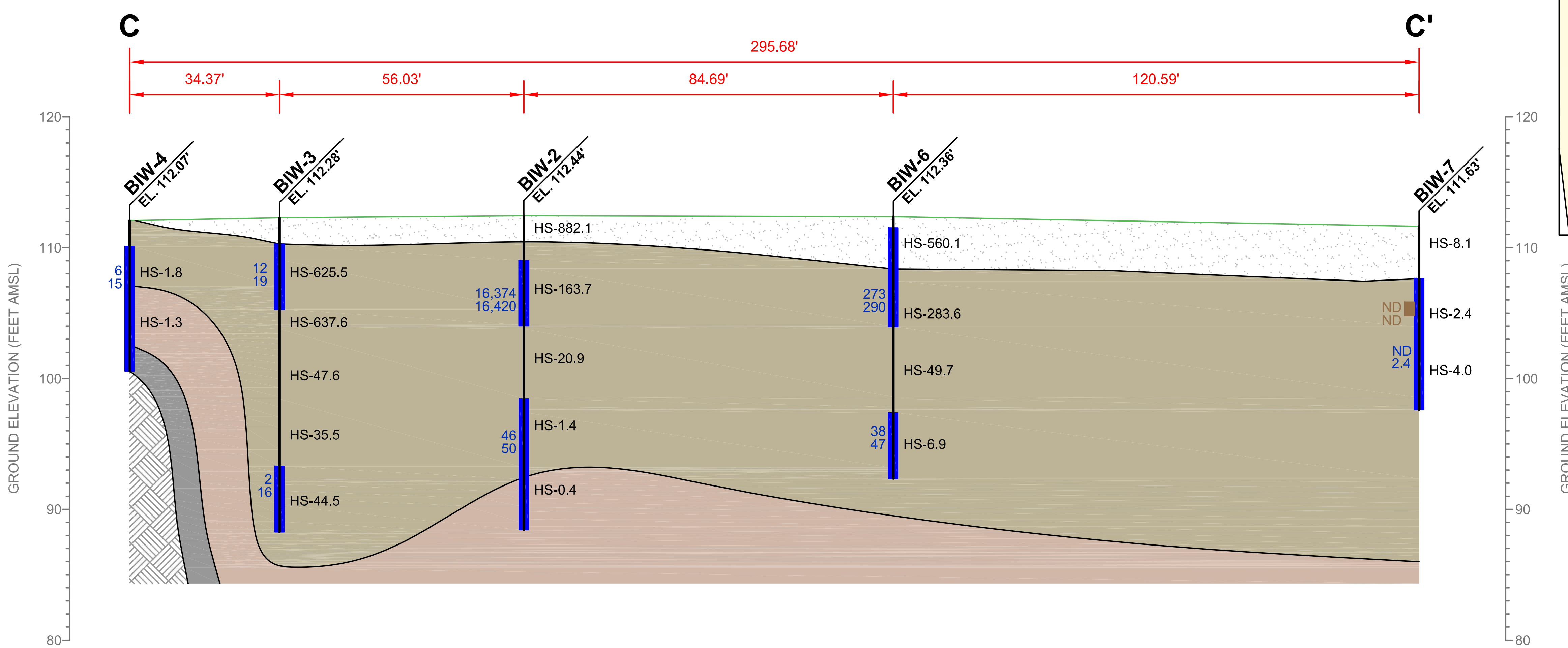
APPENDIX B-2
CROSS-SECTION B-B'

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2013
60279080



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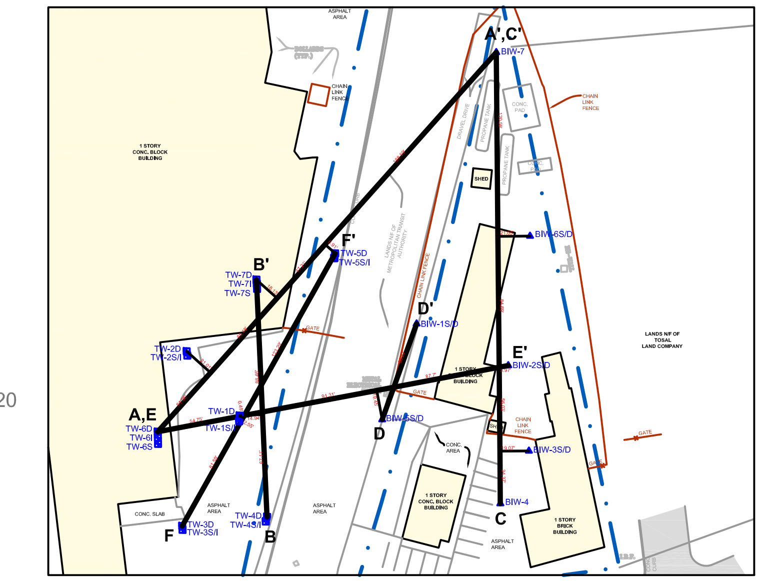

0 15 30 60

SCALE IN FEET
HORIZONTAL SCALE

0 5 10 20

SCALE IN FEET
VERTICAL SCALE
3x EXAGGERATION

LEGEND

WELL

SCREEN INTERVAL (FT.)

SOIL SAMPLE

ND
ND TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN SOIL
TOTAL VOCS IN SOIL

2
16 TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN GROUNDWATER
TOTAL VOCS IN GROUNDWATER

SAND AND GRAVEL

CLAYEY SILT AND SAND

SILTY CLAY

GLACIAL TILL

BEDROCK

NOTES

1. NO SOIL SAMPLES WERE COLLECTED ON STAR GAS PROPERTY
2. SOIL RESULTS DISPLAYED IN MICROGRAMS PER KILOGRAM (µg/kg)
3. GROUNDWATER RESULTS DISPLAYED IN MICROGRAMS PER LITER (µg/L)
4. NA - NOT AVAILABLE
5. NS - NOT SAMPLED
6. HS - HEAD SPACE (PARTS PER MILLION [ppm])
7. ND - NON DETECT

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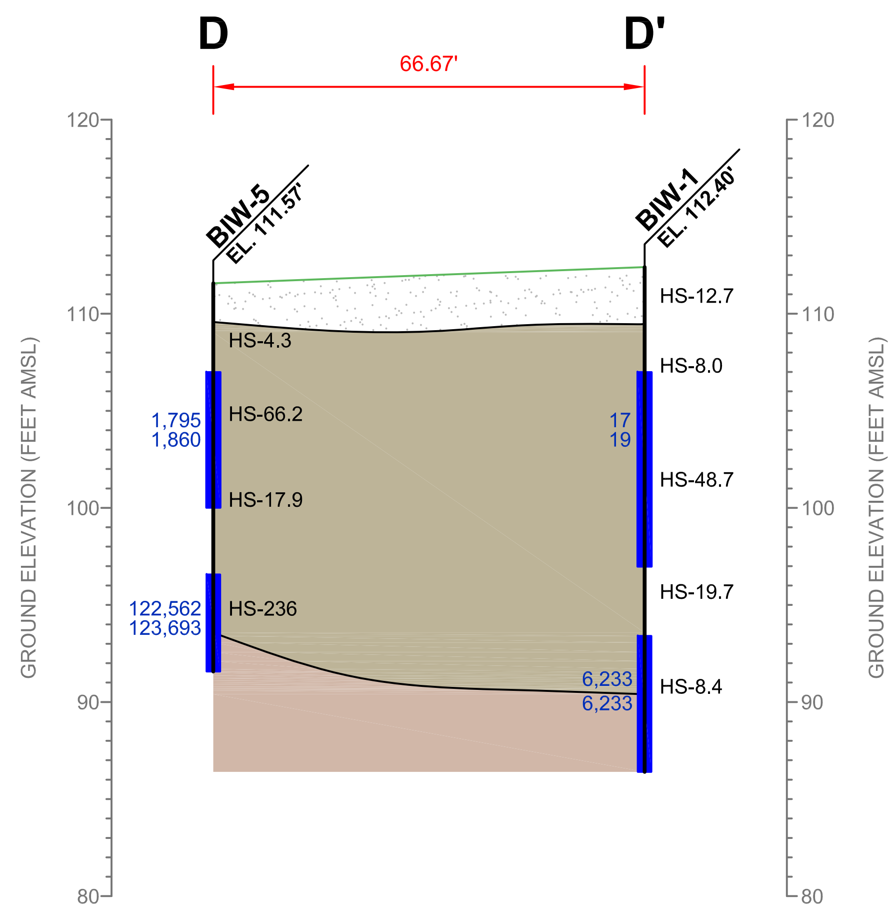
APPENDIX B-3
CROSS-SECTION C-C'

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2013 60279080



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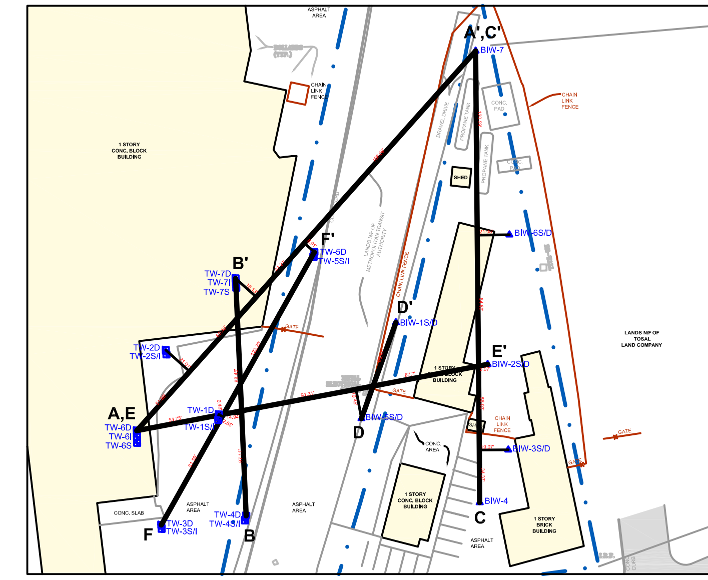

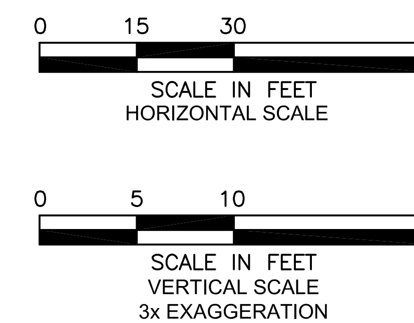

LEGEND

- WELL
- SCREEN INTERVAL (FT.)
- SOIL SAMPLE
- # / # TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN SOIL / TOTAL VOCS IN SOIL
- 6,233 / 6,233 TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN GROUNDWATER / TOTAL VOCS IN GROUNDWATER
- SAND AND GRAVEL
- CLAYEY SILT AND SAND
- SILTY CLAY
- GLACIAL TILL
- BEDROCK

NOTES

1. NO SOIL SAMPLES WERE COLLECTED ON STAR GAS PROPERTY
2. SOIL RESULTS DISPLAYED IN MICROGRAMS PER KILOGRAM (µg/kg)
3. GROUNDWATER RESULTS DISPLAYED IN MICROGRAMS PER LITER (µg/L)
4. NA - NOT AVAILABLE
5. NS - NOT SAMPLED
6. HS - HEAD SPACE (PARTS PER MILLION [ppm])
7. ND - NON DETECT

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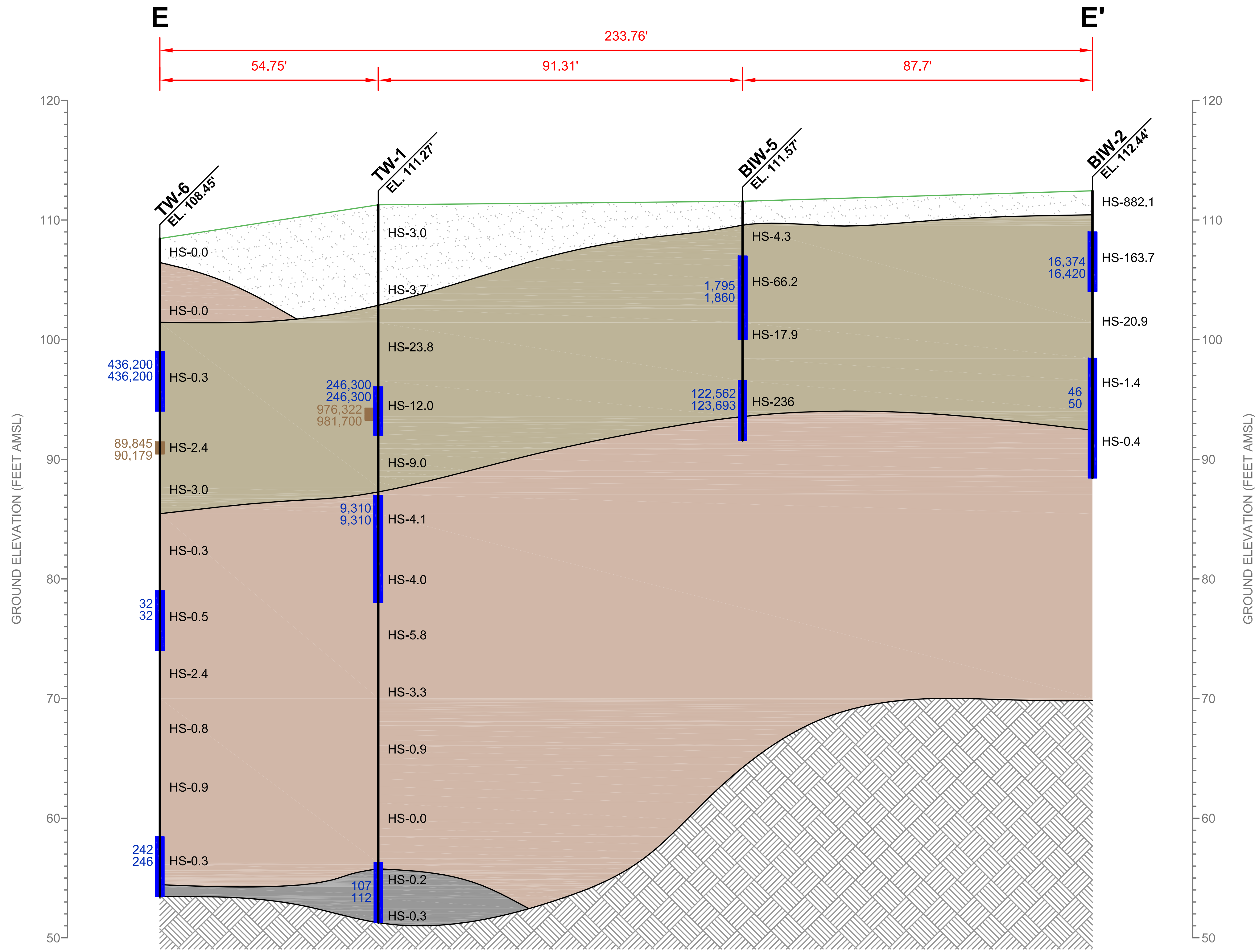
APPENDIX B-4
CROSS-SECTION D-D'

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2013 60279080



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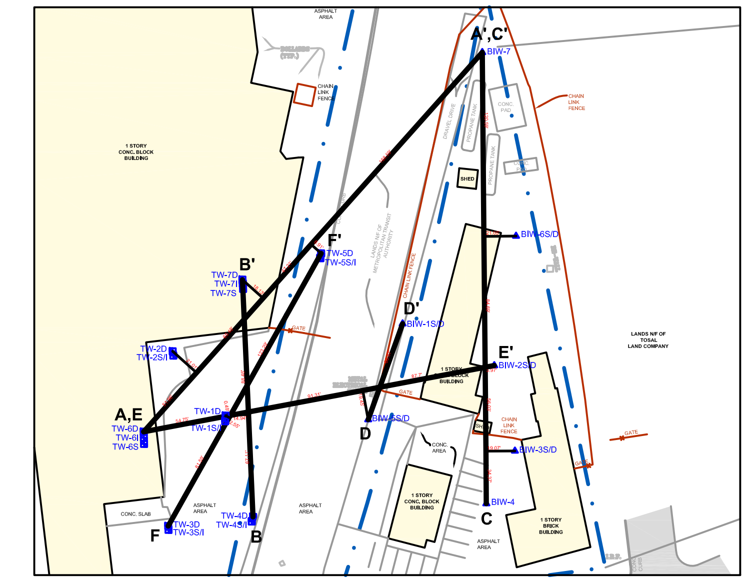

0 15 30 60
SCALE IN FEET
HORIZONTAL SCALE

0 5 10 20
SCALE IN FEET
VERTICAL SCALE
3x EXAGGERATION

LEGEND

WELL	
SCREEN INTERVAL (FT.)	SAND AND GRAVEL
SOIL SAMPLE	CLAYEY SILT AND SAND
	SILTY CLAY
	GLACIAL TILL
	BEDROCK

89,845 / 90,179 — TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN SOIL
TOTAL VOCS IN SOIL

242 / 246 — TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN GROUNDWATER
TOTAL VOCS IN GROUNDWATER

NOTES

1. NO SOIL SAMPLES WERE COLLECTED ON STAR GAS PROPERTY
2. SOIL RESULTS DISPLAYED IN MICROGRAMS PER KILOGRAM (µg/kg)
3. GROUNDWATER RESULTS DISPLAYED IN MICROGRAMS PER LITER (µg/L)
4. NA - NOT AVAILABLE
5. NS - NOT SAMPLED
6. HS - HEAD SPACE (PARTS PER MILLION [ppm])
7. ND - NON DETECT

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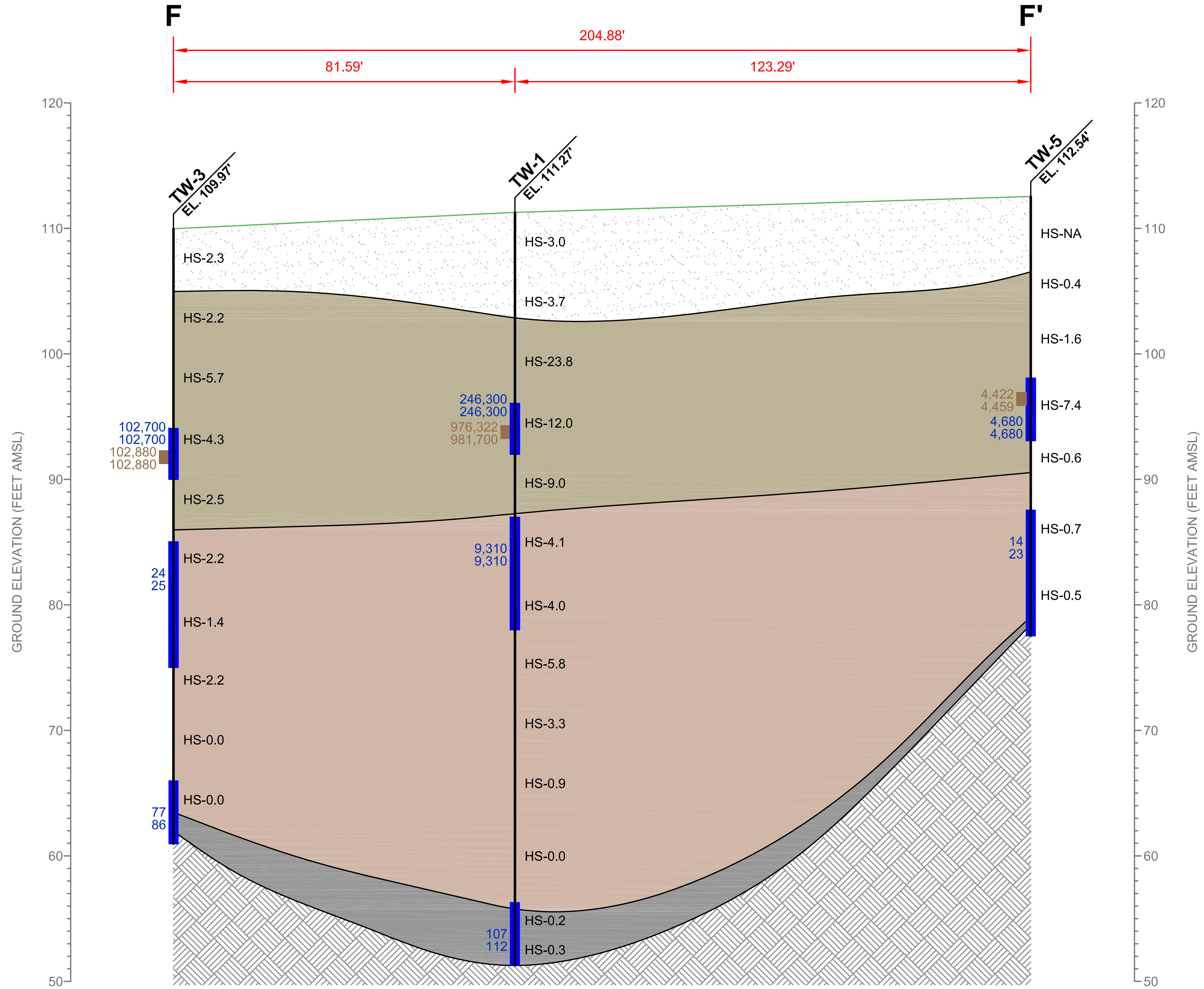
APPENDIX B-5
CROSS-SECTION E-E'

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2013 60279080



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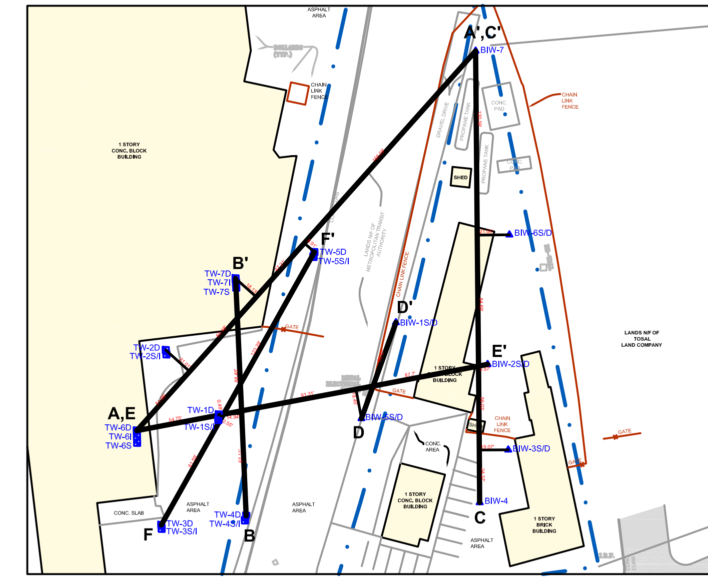

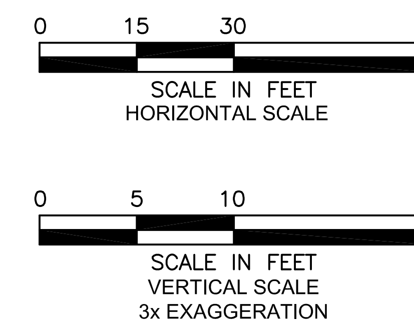

LEGEND

- WELL
- SCREEN INTERVAL (FT.)
- SOIL SAMPLE
- 102,880 / 102,880 — TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN SOIL / TOTAL VOCS IN SOIL
- 77 / 86 — TOTAL CHLORINATED VOLATILE ORGANIC COMPOUND (VOCS) IN GROUNDWATER / TOTAL VOCS IN GROUNDWATER
- SAND AND GRAVEL
- CLAYEY SILT AND SAND
- SILTY CLAY
- GLACIAL TILL
- BEDROCK

NOTES

1. NO SOIL SAMPLES WERE COLLECTED ON STAR GAS PROPERTY
2. SOIL RESULTS DISPLAYED IN MICROGRAMS PER KILOGRAM (μg/kg)
3. GROUNDWATER RESULTS DISPLAYED IN MICROGRAMS PER LITER (μg/L)
4. NA - NOT AVAILABLE
5. NS - NOT SAMPLED
6. HS - HEAD SPACE (PARTS PER MILLION [ppm])
7. ND - NON DETECT

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APPENDIX B-6
CROSS-SECTION F-F'

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2013 60279080

Appendix F

Groundwater Elevation

Contour Maps

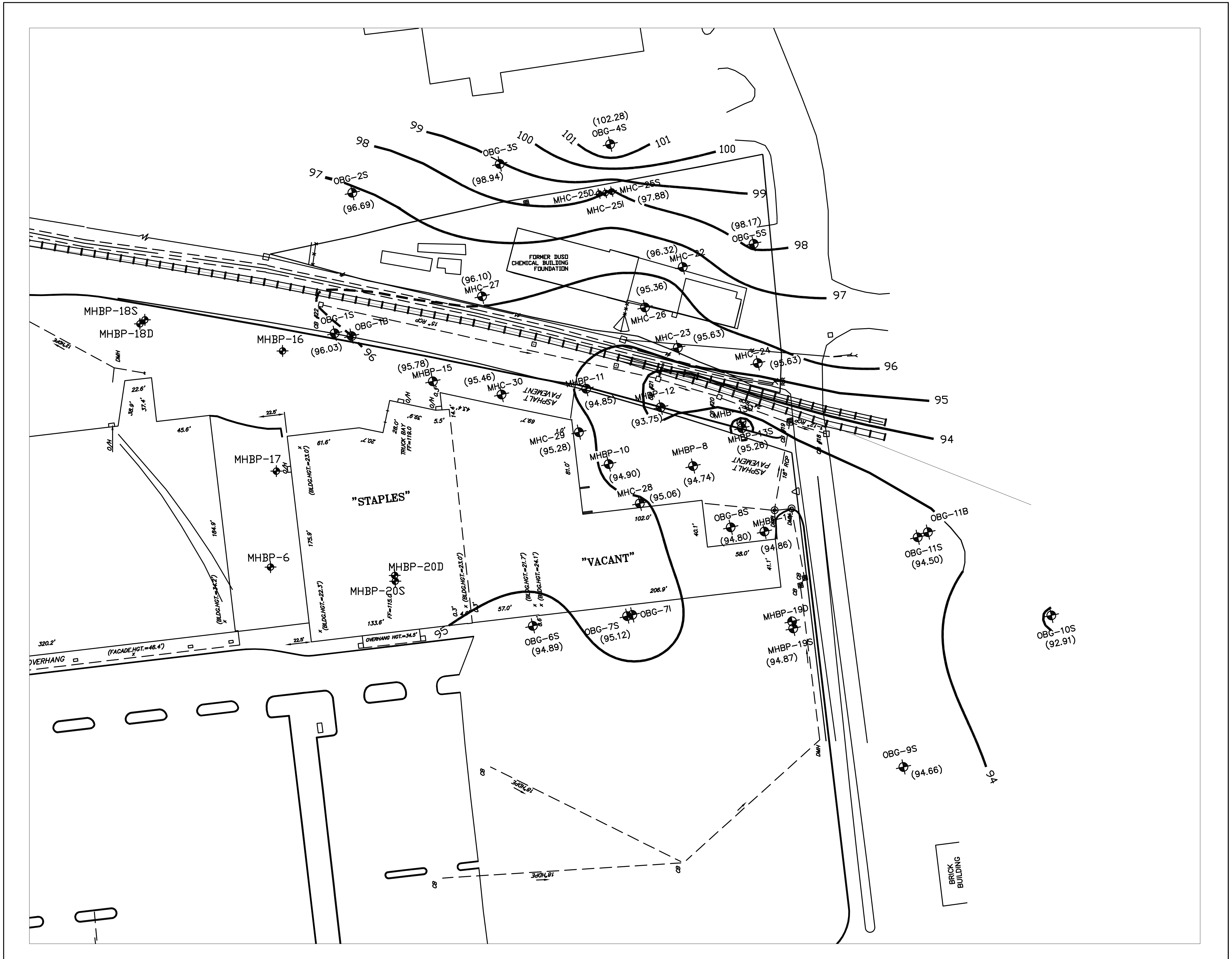


FIGURE 9

LEGEND

MHBP-16 (93.79) MONITORING WELL LOCATION WITH GROUND WATER ELEVATION IN FT AMSL

95 GROUND WATER CONTOURS (DASHED WHERE INFERRED)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORMER DUSO CHEMICAL SITE
OVERBURDEN
GROUND WATER CONTOUR
OCTOBER 10, 2005

0 80 160

35919 OB GW contour 10-05.dwg
AUGUST 2007

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 10

LEGEND

MHBP-16 (93.79) MONITORING WELL LOCATION WITH GROUND WATER ELEVATION IN FT AMSL

95 — GROUND WATER CONTOURS (DASHED WHERE INFERRED)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORMER DUSO CHEMICAL SITE
SHALLOW BEDROCK GROUND WATER CONTOUR
OCTOBER 10, 2005

0 80 160

35919 Br GW contour 10-05.dwg
AUGUST 2007

O'BRIEN & GERE ENGINEERS INC.

FIGURE 11

LEGEND

MHBP-16 (93.79) MONITORING WELL LOCATION WITH GROUND WATER ELEVATION IN FT AMSL

95 — GROUND WATER CONTOURS (DASHED WHERE INFERRED)

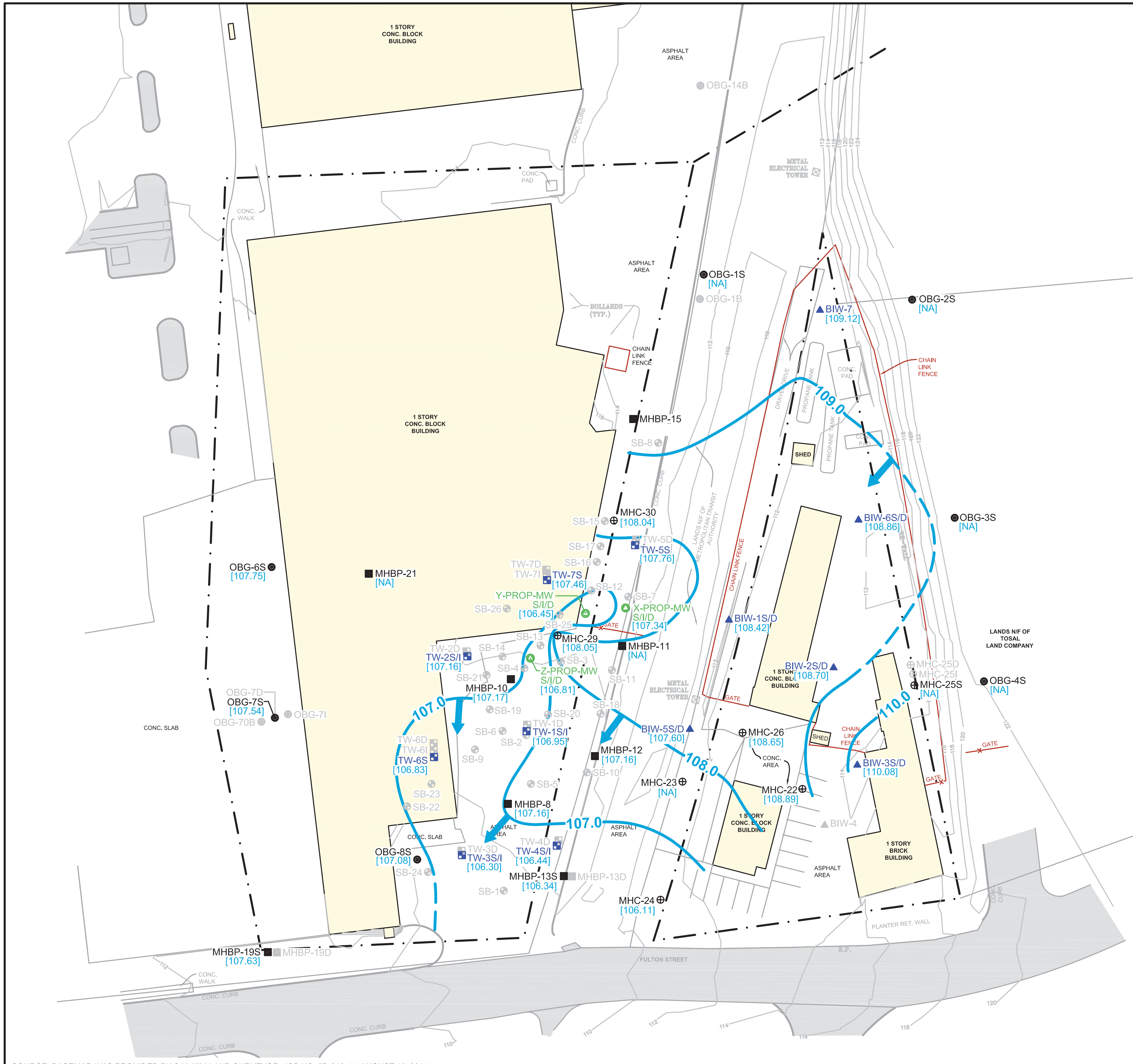
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORMER DUSO CHEMICAL SITE OVERBURDEN GROUND WATER CONTOUR MARCH 26, 2007

0 80 160

FILE NO. 10653.35919
AUGUST 2007

O'BRIEN & GERE



LEGEND

BIW-1S/D ▲	NESTED BIOREMEDIATION INJECTION WELL LOCATION (2012)
TW-1S/I	NESTED THERMAL WELL LOCATION (2012)
X-PROP-MW S/I/D	TRI-LEVEL STAINLESS STEEL WELL LOCATION (2011)
SB-15	AECOM MEMBRANE INTERFACE PROBE BORING LOCATION (2011)
OBG-2S ●	O'BRIEN & GERE WELL LOCATION (2005 & 2007)
MHBP-11 ■	MID HUDSON BUSINESS PARK WELL LOCATION (1993-1994)
MHC-30 ⊕	WELL LOCATION (1990s)
[109.12]	GROUNDWATER ELEVATION (ft amsl)
[NA]	NOT ANALYZED
	GROUNDWATER FLOW DIRECTION (APPROXIMATE)
	BUILDING
	ROAD / PAVEMENT
	TOPOGRAPHIC CONTOURS
	GROUNDWATER ISOELEVATION CONTOUR (ft amsl) (DASHED WHERE INFERRED)
	PROPERTY BOUNDARY (APPROXIMATE)
	FENCE (APPROXIMATE)
	PARCEL BOUNDARY

NOTES

1. amsl - ABOVE MEAN SEA LEVEL
2. GROUNDWATER CONTOURS WERE CONSTRUCTED USING SHALLOW WELLS (CLAYEY SILT AND SAND) AND DEEP WELLS (SILTY CLAY).

0 25 50 100
SCALE IN FEET

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FIGURE 3A
GROUNDWATER CONTOUR MAP SHALLOW WELLS

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

JANUARY 2013 60279080

SOURCE: BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.

SOURCE: BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.

LEGEND

BIW-1S/D ▲	NESTED BIOREMEDIATION INJECTION WELL LOCATION (2012)
TW-1S/I	NESTED THERMAL WELL LOCATION (2012)
X-PROP-MW S/I/D	TRI-LEVEL STAINLESS STEEL WELL LOCATION (2011)
SB-15	AECOM MEMBRANE INTERFACE PROBE BORING LOCATION (2011)
OBG-2S	O'BRIEN & GERE WELL LOCATION (2005 & 2007)
MHBP-11	MID HUDSON BUSINESS PARK WELL LOCATION (1993-1994)
MHC-30 ⊕	WELL LOCATION (1990s)
[109.12]	GROUNDWATER ELEVATION (ft amsl)
[NA]	NOT ANALYZED
	GROUNDWATER FLOW DIRECTION (APPROXIMATE)
	BUILDING
	ROAD / PAVEMENT
	TOPOGRAPHIC CONTOURS
	GROUNDWATER ISOELEVATION CONTOUR (ft amsl) (DASHED WHERE INFERRED)
	PROPERTY BOUNDARY (APPROXIMATE)
	FENCE (APPROXIMATE)
	PARCEL BOUNDARY

NOTES

1. amsl - ABOVE MEAN SEA LEVEL
2. GROUNDWATER CONTOURS WERE CONSTRUCTED USING SHALLOW WELLS (CLAYEY SILT AND SAND) AND DEEP WELLS (SILTY CLAY).

0 25 50 100

SCALE IN FEET

AECOM

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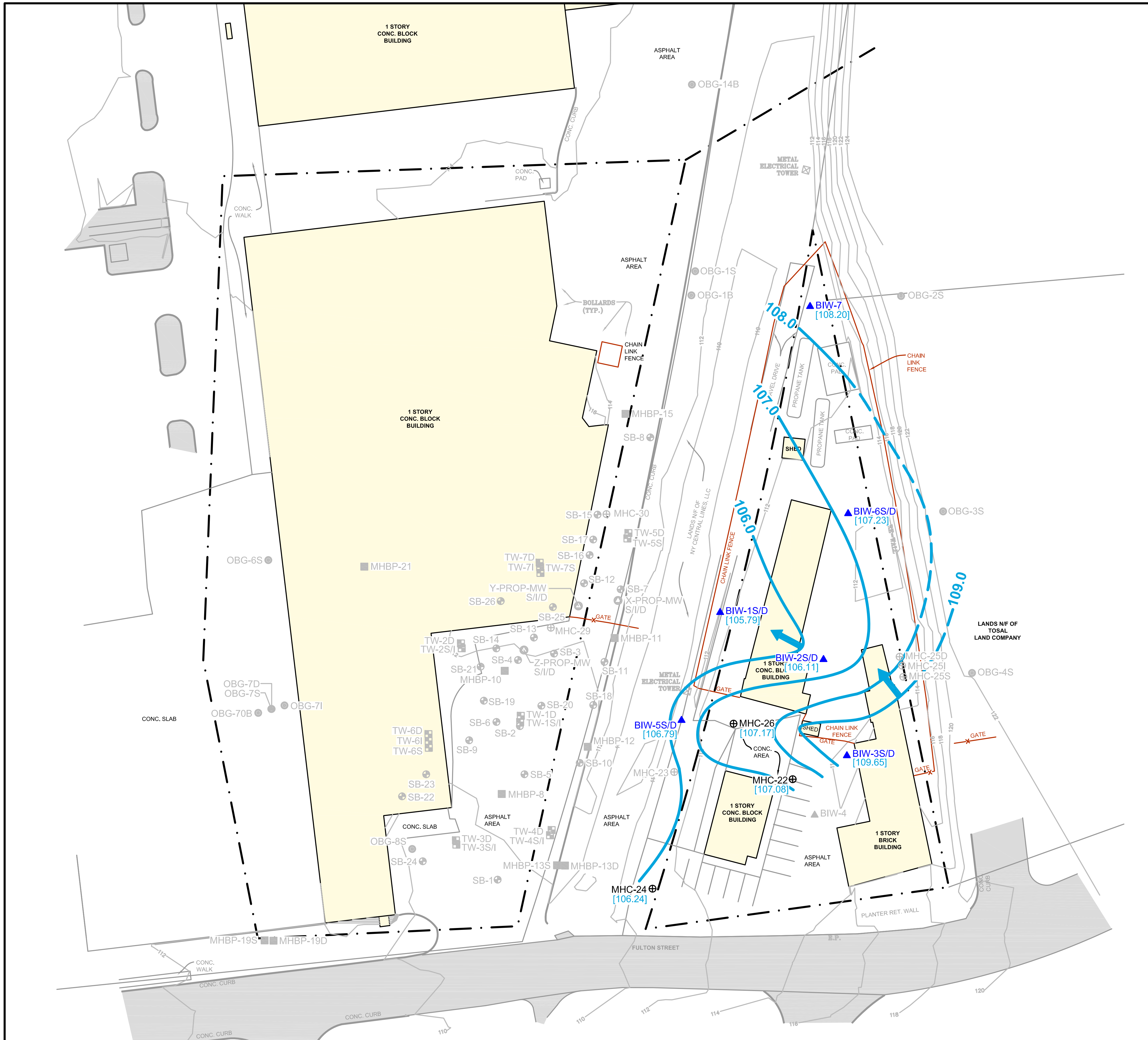
FIGURE 3B
GROUNDWATER CONTOUR MAP DEEP WELLS

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

JANUARY 2013 60279080

L:\Group\earth\Latham NY Work\NYSDEC Former Duso Chem Site\60279080_006 GW Contour Map Deep Wells.dwg, 1/31/2013 1:39:58 PM, Splawnm



LEGEND

BIW-1S/D ▲	NESTED BIOREMEDIATION INJECTION WELL LOCATION (2012)
TW-1S/I	NESTED THERMAL WELL LOCATION (2012)
X-PROP-MW S/I/D	TRI-LEVEL STAINLESS STEEL WELL LOCATION (2011)
SB-15	AECOM MEMBRANE INTERFACE PROBE BORING LOCATION (2011)
OBG-2S	O'BRIEN & GERE WELL LOCATION (2005 & 2007)
MHBP-11	MID HUDSON BUSINESS PARK WELL LOCATION (1993-1994)
MHC-30 ⊕	WELL LOCATION (1990s)
[108.20]	GROUNDWATER ELEVATION (ft amsl)
	GROUNDWATER FLOW DIRECTION (APPROXIMATE)
	BUILDING
	ROAD / PAVEMENT
	TOPOGRAPHIC CONTOURS
	GROUNDWATER ISOELEVATION CONTOUR (ft amsl) (DASHED WHERE INFERRED)
	PROPERTY BOUNDARY (APPROXIMATE)
	FENCE (APPROXIMATE)
	PARCEL BOUNDARY

NOTES

1. amsl - ABOVE MEAN SEA LEVEL
2. GROUNDWATER CONTOURS WERE CONSTRUCTED USING SHALLOW WELLS (CLAYEY SILT AND SAND) AND DEEP WELLS (SILTY CLAY).

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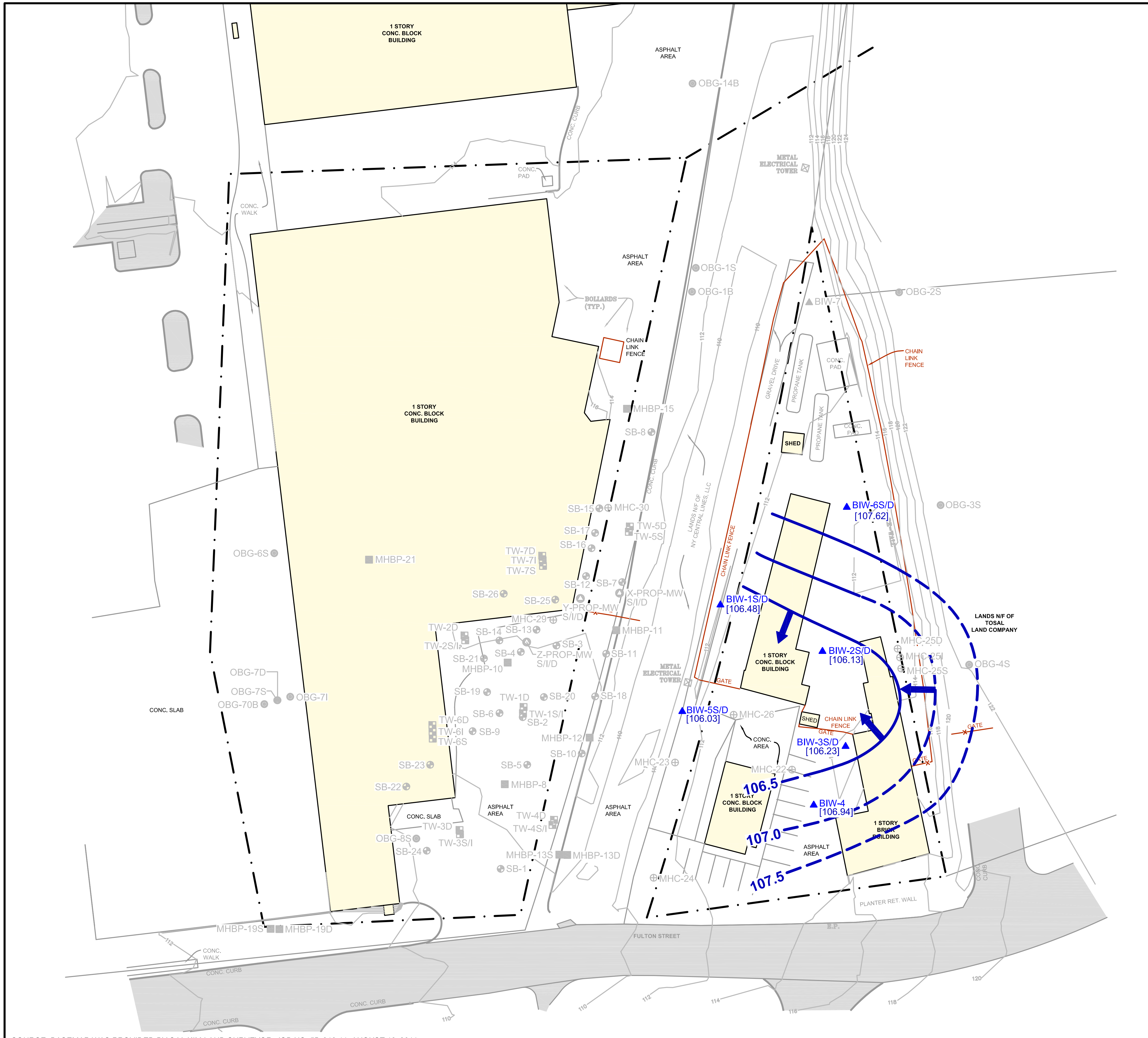
FIGURE 3
GROUNDWATER CONTOUR MAP
SHALLOW WELLS
OCTOBER 2016

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2017 60279080

SOURCE: BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.

L:\Group\earth\Latham NY Work\NYSDEC Former Duso Chem Site\60279080_047 GW Contour Map Shallow Wells_Oct2016 Results.dwg, 2/23/2017 11:03:12 AM, Splawnm



SOURCE: BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.

LEGEND

BIW-1S/D ▲	NESTED BIOREMEDIATION INJECTION WELL LOCATION (2012)
TW-1S/I	NESTED THERMAL WELL LOCATION (2012)
X-PROP-MW S/I/D	TRI-LEVEL STAINLESS STEEL WELL LOCATION (2011)
SB-15	AECOM MEMBRANE INTERFACE PROBE BORING LOCATION (2011)
OBG-2S	O'BRIEN & GERE WELL LOCATION (2005 & 2007)
MHBP-11	MID HUDSON BUSINESS PARK WELL LOCATION (1993-1994)
MHC-30 ⊕	WELL LOCATION (1990s)
[109.12]	GROUNDWATER ELEVATION (ft amsl)
	GROUNDWATER FLOW DIRECTION (APPROXIMATE)
	BUILDING
	ROAD / PAVEMENT
112	TOPOGRAPHIC CONTOURS
	GROUNDWATER ISOELEVATION CONTOUR (ft amsl) (DASHED WHERE INFERRED)
	PROPERTY BOUNDARY (APPROXIMATE)
	FENCE (APPROXIMATE)
	PARCEL BOUNDARY

NOTES

1. amsl - ABOVE MEAN SEA LEVEL
2. GROUNDWATER CONTOURS WERE CONSTRUCTED USING SHALLOW WELLS (CLAYEY SILT AND SAND) AND DEEP WELLS (SILTY CLAY).

0 25 50 100
SCALE IN FEET

AECOM

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FIGURE 4
GROUNDWATER CONTOUR MAP
DEEP WELLS
OCTOBER 2016

FORMER DUSO CHEMICAL FACILITY
33 FULTON STREET, POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2017 60279080

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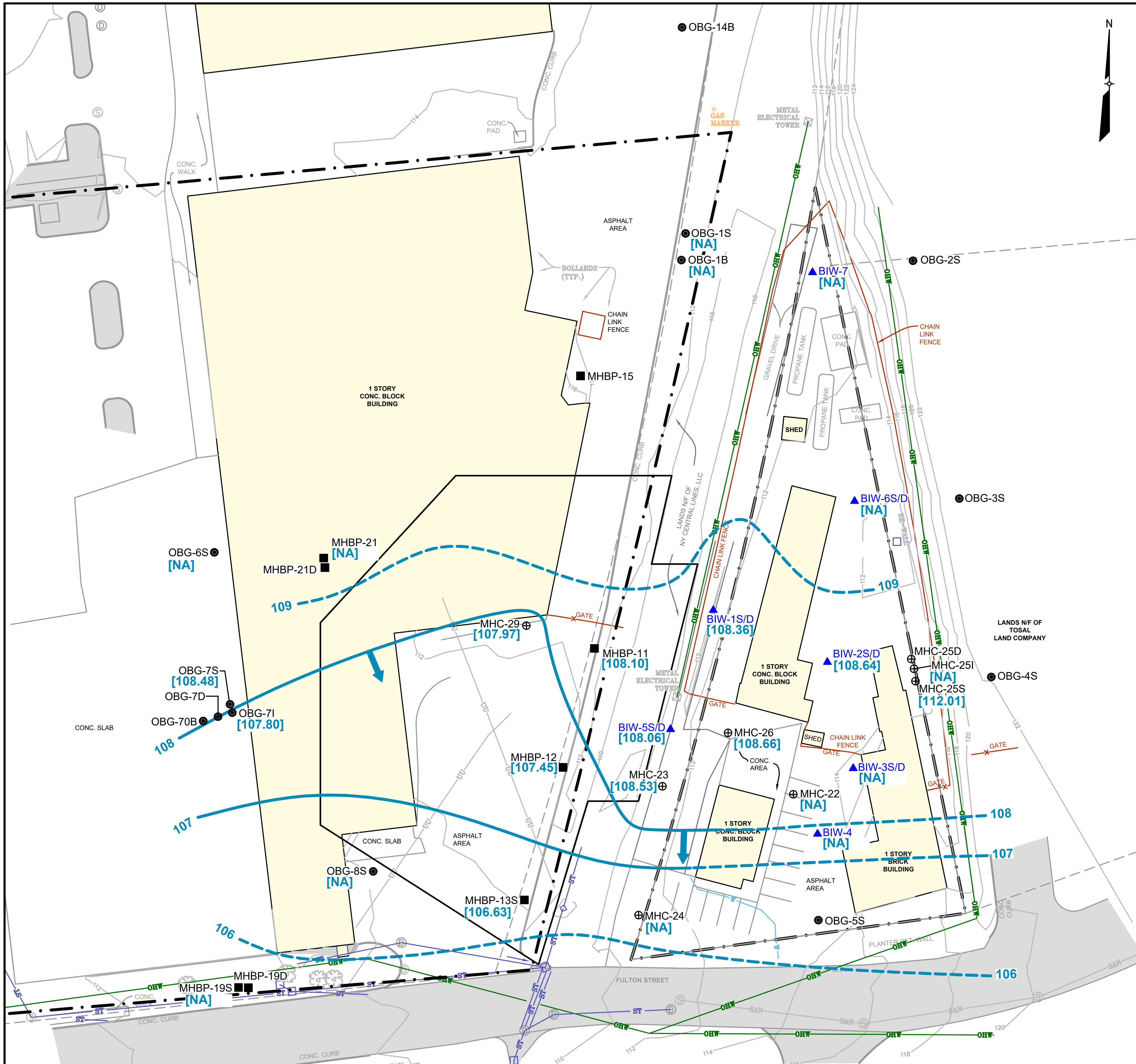

LEGEND

BIW-1S/D ▲	BIOREMEDIATION INJECTION WELL LOCATION (2012)
OBG-2S ●	O'BRIEN & GERE WELL LOCATION (2005 & 2007) (APPROXIMATE)
MHBP-11 ■	MID-HUDSON BUSINESS PARK WELL LOCATION (1993-1994, 2015)
MHC-30 ⊕	WELL LOCATION (1990s)
	CATCH BASIN
	MANHOLES
	TREES
	GROUNDWATER FLOW DIRECTION
[107.26]	GROUNDWATER CONTOUR (FT. ABOVE MEAN SEA LEVEL) (DASHED WHERE INFERRED)
[NA]	NOT AVAILABLE
	BUILDING
	ROAD / PAVEMENT
112	TOPOGRAPHIC CONTOURS
	PROPERTY BOUNDARY
x	FENCE (APPROXIMATE)
	PARCEL BOUNDARY
OHW	OVERHEAD WIRES
W	UNDERGROUND WATER
SAN	SANITARY SEWER LINE
ST	STORMWATER LINE
UU	UNKNOWN UNDERGROUND UTILITIES
	MHBP TREATMENT AREA (APPROXIMATE IC BOUNDARIES)
	DUSO SITE BOUNDARY (APPROXIMATE IC BOUNDARIES)

* MHC-25S NOT CONTOURED, OUTLIER

0 55 110
SCALE IN FEET

SOURCE: - BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.
- MHBP AND MHC WELL LOCATIONS FROM COORDINATES IN GROUNDWATER SAMPLING FIELD SHEET SUMMARY SPREADSHEET, PROVIDED BY CHAZEN.

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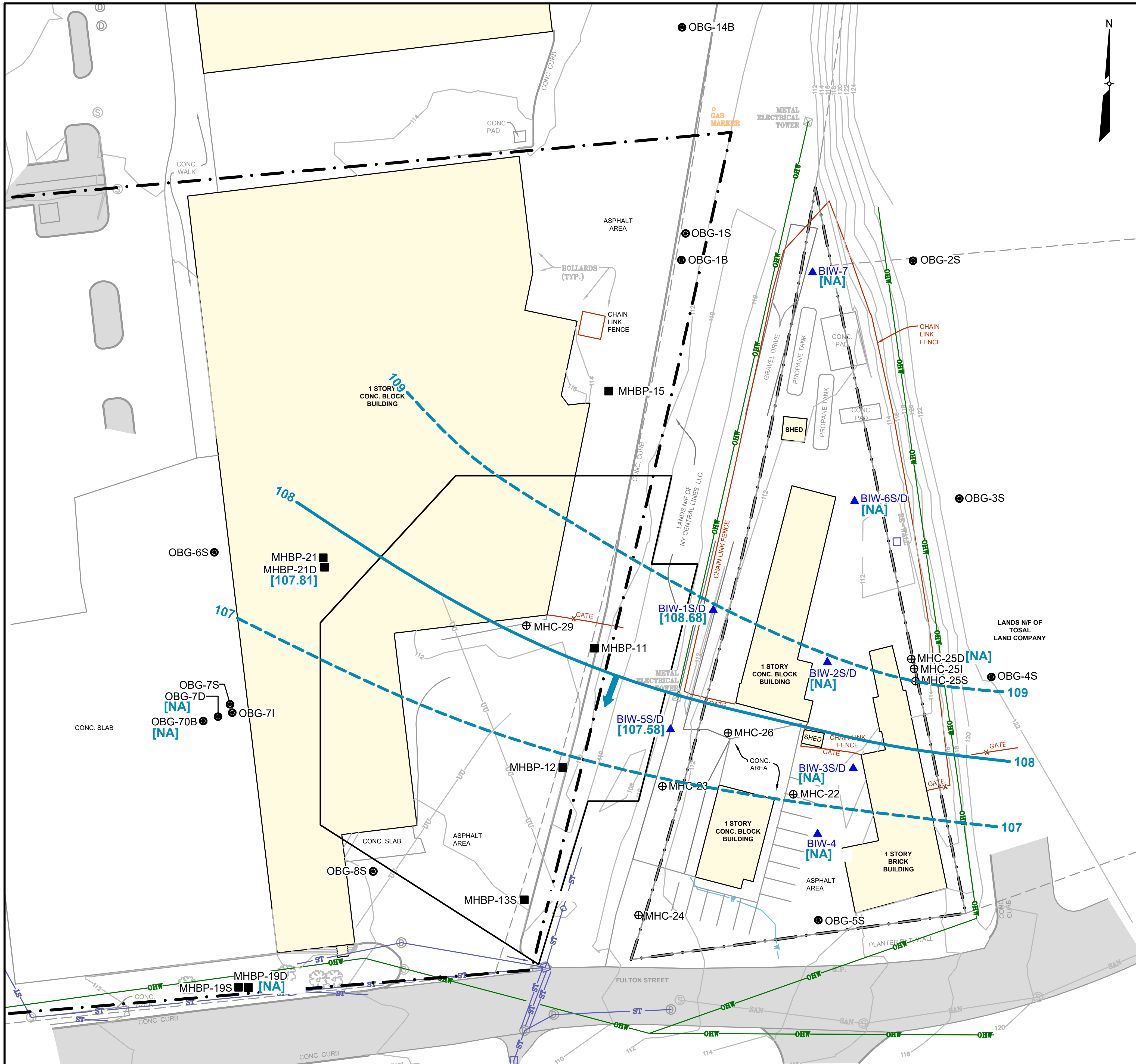
T: (518) 951-2200
F: (518) 951-2300

FIGURE 3
GROUNDWATER ELEVATION CONTOUR MAP
SHALLOW MONITORING WELLS
NOVEMBER 1, 2021

FORMER DUSO CHEMICAL FACILITY
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2022 60647169



LEGEND

BIW-1S/D ▲	BIOREMEDIATION INJECTION WELL LOCATION (2012)
OBG-2S ⦿	O'BRIEN & GERE WELL LOCATION (2005 & 2007) (APPROXIMATE)
MHBP-11 ■	MID-HUDSON BUSINESS PARK WELL LOCATION (1993-1994, 2015)
MHC-30 ⊕	WELL LOCATION (1990s)
	CATCH BASIN
	MANHOLES
	TREES
	GROUNDWATER FLOW DIRECTION
[106.83]	GROUNDWATER CONTOUR (FT. ABOVE MEAN SEA LEVEL) (DASHED WHERE INFERRED)
[NA]	NOT AVAILABLE
	BUILDING
	ROAD / PAVEMENT
112	TOPOGRAPHIC CONTOURS
	PROPERTY BOUNDARY
x	FENCE (APPROXIMATE)
	PARCEL BOUNDARY
OHW	OVERHEAD WIRES
	UNDERGROUND WATER
SAN	SANITARY SEWER LINE
ST	STORMWATER LINE
UU	UNKNOWN UNDERGROUND UTILITIES
	MHBP TREATMENT AREA (APPROXIMATE IC BOUNDARIES)
	DUSO SITE BOUNDARY (APPROXIMATE IC BOUNDARIES)

0 55 110

SCALE IN FEET

SOURCE: - *BASEMAP WAS PROVIDED BY S.Y. KIM LAND SURVEYOR, JOB NO: 5D-316-11, AUGUST 16, 2011.*
- *MHBP AND MHC WELL LOCATIONS FROM COORDINATES IN GROUNDWATER SAMPLING FIELD SHEET SUMMARY SPREADSHEET, PROVIDED BY CHAZEN.*

AECOM

40 British American Blvd.
Latham, New York 12110
T: (518) 951-2200
F: (518) 951-2300

FIGURE 4
GROUNDWATER ELEVATION CONTOUR MAP
DEEP MONITORING WELLS
NOVEMBER 1, 2021

FORMER DUSO CHEMICAL FACILITY
FULTON STREET AND NORTH ROAD
POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

MARCH 2022 60647169

Appendix G

Star Gas Products, Inc. Sub-Slab Depressurization System IRM Work Plan, Vapor Intrusion Manual and Inspection Documents

APPENDIX F.3

Former Duso Chemical Facility IRM
January 16, 2005 IRM Work Plan
Star Gas Products

O'BRIEN & GERE

January 16, 2005

Mr. John Miller
Division of Environmental Remediation
Remedial Bureau C
New York State Department of Environmental Conservation
625 Broadway, 11th Floor
Albany, New York 12233-7013

Re: Work Assignment #D004090-19.1
Former Duso Chemical
Site #3-14-103
Interim Remedial Measure Work Plan

File: 10653/35919 #5

Dear Mr. Miller:

The following presents the work plan for activities associated with implementing the Interim Remedial Measure (IRM) for the Former Duso Chemical Site, located in Poughkeepsie, New York. As stated your August 31, 2005 letter, the IRM for the site is a sub-slab depressurization system (SDS) for the Star Gas Products building located at 33 Fulton Street. The purpose of the SDS is to mitigate potential vapor intrusion that could impact indoor air quality of the Star Gas building. In the same letter, the Department requested that O'Brien & Gere conduct design diagnostic testing and prepare an IRM work plan.

This work plan provides a summary of the recent site investigation that resulted in the selected IRM, and discusses the IRM's design and how it will be installed, commissioned, operated and maintained. Also included is a cost estimate and schedule for the system installation and commissioning. This plan is submitted to the Department for approval prior to implementation of the IRM.

BACKGROUND

As part of the on-going Remedial Investigation/Feasibility Study (RI/FS), O'Brien and Gere conducted sub-slab soil vapor and indoor air sampling of the former Duso Chemical site in July 2005. Samples were collected in the Star Gas office building only. The purpose of the sampling was to collect data to assess the extent of contamination at the site and to evaluate the extent to which these contaminants pose a threat to human health or the environment.

Upon review of the sampling results by the Department, the New York State Department of Health (NYSDOH), and O'Brien and Gere, it was concluded that there exists the potential for vapor intrusion to impact the indoor air quality of the Star Gas building, and that an SDS should be installed to mitigate potential future exposures to the contamination.

The SDS will be installed as a permanent, integral addition to the building. The system will incorporate design features to lower the sub-slab pressure, limit energy usage, avoid compromising moisture and temperature controls, and limit noise. The system will create a negative pressure field directly under the slab and around the foundation. This negative pressure field becomes a collection "sink" for the gases present in the vicinity of the building. Intercepted gases would be piped to a discharge point to the atmosphere.

INTERIM REMEDIAL MEASURE

Sub-Slab Depressurization System Design

A site visit to the Star Gas building was conducted on October 5, 2005. The purpose of the visit was to conduct diagnostic testing that would be used to develop a preliminary design of the SDS. The testing involved simulation of sub-slab depressurization and field extension pressure measurements (also known as communication testing). The results of the testing were used to locate a system suction point (SSP), which is the point through the slab where a vacuum will be pulled via a system fan.

Communication testing was performed by use of a commercial shop vacuum to draw a vacuum under the building's slab through a 1-inch diameter communication test suction hole (CTSH). Depressurization was measured at communication test points (CTPs) at all four quadrants and near the perimeter of the building using a micro-manometer. Figure 1 is a scaled drawing of the building showing pertinent interior features as well as locations of the CTSHs and CTPs as tested during the site visit.

Communication testing was initially performed using CTSH 1. It was found that communication was acceptable (depressurization >0.002 inches of water ("wg)) in CTPs C and D: however, communication was not acceptable in CTPs A and B. Therefore, a second location, CTSH 2, was installed and yielded sufficient communication at all CTPs. Since CTSH 2 was shown to be a suitable and effective SSP, it will be used as the only SSP for the system. The results of the communication testing and other pertinent design observations are provided on field data sheets in Attachment A.

Note that the slab could not be inspected thoroughly as it was entirely covered with linoleum tile. However, the tiles were found to be in good shape and no major cracks or voids in the underlying slab were observed.

In addition to communication testing, building materials that would be disturbed by the SDS installation were inspected for potential asbestos containing materials (ACMs). Samples of the floor tile, floor tile mastic, and ceiling tile were collected and sent to AmeriSci New York to be analyzed for ACMs. Figure 1 shows the location from which the samples were collected. Laboratory results, provided in Attachment B, indicate that the floor tile contains asbestos. Therefore, a New York State licensed and certified asbestos abatement contractor will remove a small portion (<1 square foot) of floor tile that will be disturbed during installation of the SSP. The contractor will follow the New York State Industrial Code Rule 56 and federal regulations 29CFR 1926.1101.

Sub-Slab Depressurization System Installation and Commissioning

The ventilation system will be installed at a time scheduled between the installation crew and the property owner. During the installation, the following will occur:

1. Sealing of evident floor cracks and cracks in the floor/wall interface using caulk.

2. Installation of SSP1 using 4-inch diameter PVC pipe at the location indicated on Figure 1. After cutting a hole through the slab, sub-slab material will be removed to create a pocket under the slab of approximately one cubic foot. The pipe will be sealed to the hole and rise up through the drop ceiling. In this particular design, the installation crew will install and cap off a "tee" fitting above the ceiling to allow for installation of an additional SSP if found necessary during system commissioning.

3. The SSP1 pipe will be routed to a high pressure and low flow centrifugal fan, Fantech Model GP-501, located on the northern exterior wall of the building. (Based upon our previous experience, the results of the diagnostic communication testing indicate that the Fantech Model GP-501 is needed.) From this fan unit, a discharge stack will be installed to a point at least 1 foot above the eave of the roof.

4. A licensed electrical contractor will hardwire the fan unit into an existing junction box near the point of fan installation. The circuit load will be tested, and only a circuit exhibiting less than 80 percent load will be utilized to operate the fan. A lockable switch (lockable using a tie strap) will be installed between the junction box and the fan.

5. Permanent stickers will be placed accordingly to identify all piping and electrical connections. A U-tube manometer will be placed on SSP1 at eye-level so the property owner can use it as an operational check of the system. The manometer will continuously measure the static pressure (vacuum) in SSP1.

6. Upon completion of the installation, the system will be commissioned. With the fan on, communication testing will be conducted utilizing the same CTPs used during the diagnostic testing. The system will be considered effective if each CTP yields negative sub-slab pressure greater than <0.002"wg (as measured with a micro-manometer). If this is not successfully accomplished using SSP1, a second SSP will be installed at the CTSH1 location to facilitate additional depressurization under the southern portion of the slab. Communication testing will again be conducted to verify effective communication in all quadrants of the slab with both SSPs in operation.

7. Innocuous smoke testing of pipe joints and SSP seal(s) will be conducted to verify that no leaks are present in the SDS. Additionally, smoke testing will be used to verify that the SDS has not created a back-draft condition on the building's hot water heater.

8. Upon completion of commissioning activities, the property owner/tenant will be briefed on the SDS components. During this step, the property owner will be

instructed on how to check system performance (using the U-tube manometer), and what to do in the event of a system shutdown. Electrical connections including the SDS switch and junction box tie-in location will be pointed out to the property owner. The owner/tenant will be given a Fact Sheet that describes the system's operation and the owner's/tenant's responsibilities.

The successful completion and results of the above activities will be documented on field forms (examples of which are contained in Attachment C of this document). Digital photographs will also be taken of installed SDS components. An as-built drawing will be completed showing pipe routing, fan location, and electrical connections. The documentation and drawing will be submitted to the Department for its records.

Post-Mitigation Sampling

To confirm the effectiveness of the SDS at lowering vapor intrusion, indoor and sub-slab sampling will be conducted no less than 30 days after the SDS installation and commissioning. Three samples will be collected: one sub-slab, one indoor, and one ambient. The sampling protocol will be consistent with the *RI/FS Field Activities Plan (FAP)* (O'Brien & Gere, March 2005).

A letter report will be submitted to the State within six weeks after sample collection. The letter will present the results of the sampling and include the laboratory reports.

Sub-Slab Depressurization System Operation and Maintenance

Sub-slab depressurization systems are a simple, reliable, proven and the preferred method for preventing subsurface vapor intrusion into structures. The particular low pressure and high flow centrifugal fan that will be used on this project comes with a 5-year manufacturer's warranty and has a 10-year life expectancy.

As part of a long-term operation and maintenance (O&M) program, the property owner/tenant will assume primary responsibility for verifying SDS operation through periodic checks of the U-tube manometer installed at each SSP. If the owner/tenant observes a change in manometer reading, they will contact the Department. A telephone number will be provided to the owner/tenant to be used for maintenance requests.

The owner/tenant of the building will also be asked to notify the Department in the event that any remodeling of the structure, additions to the structure, or updating of heating units are planned. System modifications and/or re-commissioning may be necessary dependent on the structure change that takes place. These changes will be evaluated on an individual basis by the Department, and necessary action should be taken such that the system provides effective depressurization as designed and commissioned.

The SDS should also be inspected on a routine basis. O'Brien and Gere will complete the initial O&M inspection within 18 months of its original commissioning date. The inspection will consist of a visual inspection of the components both indoors and outdoors. An inspection of the fan will focus on noise, vibration, and operational issues. Piping, piping connections, and piping supports will be checked. Manometer readings at the fan and at each SSP will be recorded and compared to commissioned values. If the readings indicate possible degradation of the sub-slab depressurization, communication testing will be conducted to evaluate whether the depressurization had dropped below 0.002"wg. If it has, the system will be modified and re-commissioned. Inspections and tests will be documented. Subsequent inspections should follow the same schedule of 18-month intervals until such a time that the necessity of the SDS operation is re-evaluated by the Department and NYSDOH.

WORK ASSIGNMENT BUDGET

The estimate includes a budget of $14,605 for installation of up to two SSPs. The budget includes subcontractor costs for the asbestos removal and post-mitigation sampling. Accutest Laboratories, the same laboratory that analyzed the RI/FS samples, will also analyze the post-mitigation samples.

The cost estimate to conduct one routine inspection and for a non-routine maintenance investigation (when the property owner calls the Department about a suspected problem with the SDS) is $4,291. The routine inspection estimate assumes that there is no need for repairs. The non-routine maintenance estimate includes $100 for replacement parts or supplies. It assumes that repair of the system can be made during the same 4-hour site visit as the investigation. Additional parts, supplies, or hours on-site would increase the cost accordingly.

The total budget of $18,896 consists of the estimated costs to complete the above-described tasks based on the current status of the project and available information and assumptions stated in this PMWP. The costs of the project may be affected by additional information or issues raised during execution of the project. Out of scope efforts will be estimated and presented to the Department for approval prior to execution.

SCHEDULE

The installation and commissioning can be scheduled within two weeks after receiving notice to proceed. One site visit is anticipated to complete the installation and commissioning. The documentation and drawing discussed above will be submitted within four weeks thereafter.

We appreciate the opportunity to provide continued services to the Department. Should you have any questions regarding this scope of work, schedule, or associated costs, please do not hesitate to contact Kara Whitehead, the project manager for this Work Assignment at (518) 452-9392, or me at (315) 437-6100 at your convenience.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

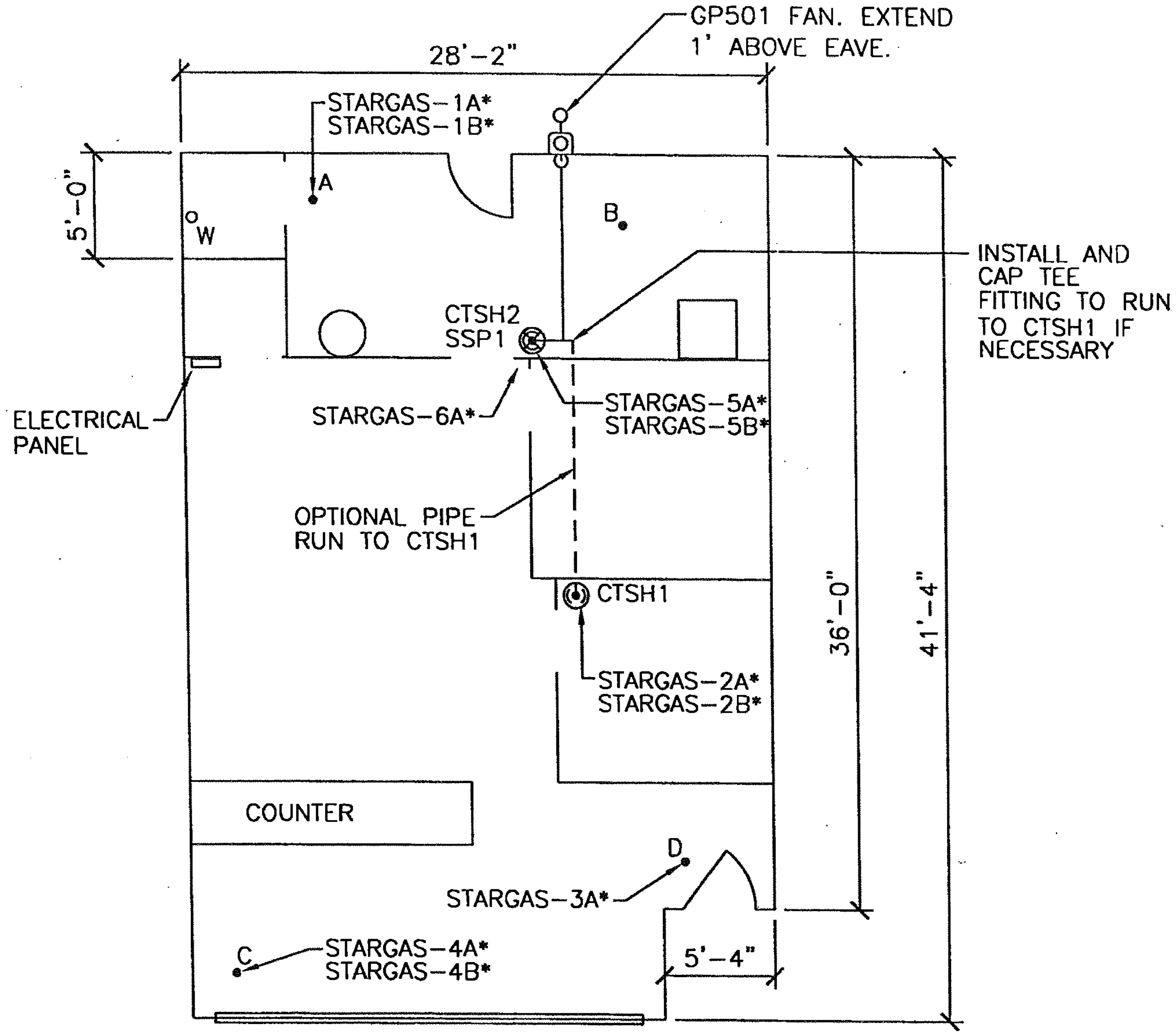
Douglas M. Crawford

Douglas M. Crawford, P.E.
Vice President

Enclosures: Figure 1 – First Floor Plan, Star Gas Products
Attachment A – Design Visit Data Sheets
Attachment B – Laboratory Results of Asbestos Analysis
Attachment C – Example Post-Commissioning Field Data Sheets

cc: Ms. Laurie Rizzo – NYSDEC
Eric M. Alongi – O'Brien & Gere
Mark A. Distler – O'Brien & Gere
Ralph E. Morse, CPG – O'Brien & Gere
Kara L. Whitehead – O'Brien & Gere

Figures



FRONT OF BUILDING (FULTON STREET)

FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. DIMENSIONS SHOWN ON FIGURE ARE APPROXIMATE INSTALLATION LOCATIONS AND SHALL BE FIELD VERIFIED BY INSTALLATION CREW.
2. INSTALLATION CREW SHALL GROUT AND/OR CAULK ALL MAJOR CRACKS AND OPENINGS THAT WOULD IMPAIR VENTILATION SYSTEM PERFORMANCE.
3. INSTALLATION CREW SHALL DETERMINE ELECTRICAL TIE-IN LOCATION OF JUNCTION BOX.
4. INSTALLATION CREW SHALL SECURE EQUIPMENT AND PIPING TO PREVENT ANY MOVEMENT.
5. INSTALLATION CREW SHALL INSTALL A BLADEX VALVE ON EACH SYSTEM SUCTION POINT.
6. * DENOTES ASBESTOS SAMPLE IDENTIFICATION

DESIGN 10/19/05

Plot Date: 10/19/05 EMA

FIGURE 1

LEGEND

- S — SEWER
- G — NATURAL GAS
- W — WATER
- E — ELECTRICAL
- HVAC — HVAC DUCT
- PIPE/DUCT DOWN
- PIPE/DUCT UP
- EXISTING WALL
- WINDOW
- DOOR
- STAIRWAY
- HOT WATER TANK (HWT)
- BOILER
- FURNACE
- J JUNCTION BOX
- S FAN SWITCH
- CIRCUIT BREAKER PANEL
- SUMP PUMP
- FLOOR DRAIN
- COMMUNICATION TEST SUCTION HOLE (CTSH)
- COMMUNICATION TEST SUCTION HOLE AND SYSTEM SUCTION POINT
- SYSTEM SUCTION POINT (SSP)
- COMMUNICATION TEST POINT (CTP)
- NEW EXHAUST RISER PIPE
- NEW EXHAUST PIPE

FORMER DUSO CHEMICAL SITE
INTERIM REMEDIAL MEASURE

FIRST FLOOR PLAN
STAR GAS PRODUCTS

33 FULTON STREET
SITE NO. 3-14-103

8 0 8
1/8"=1'-0"

FILE NO. 35919.004
OCTOBER 18, 2005

O'BRIEN & GERE ENGINEERS INC.

Attachment A
Design Visit Data Sheets

OBRIEN&GERE

Subcontractor Checklist

Structure Address: 33 FULTON ST POUGHKEEPSIE **Date of Design Visit:** 10/5/05

Structure ID #: STARGAS

Design Team: EA/NJ

Check Yes or No if the following are potential asbestos containing materials were observed during the design visit and may be disturbed during design or installation.

	Yes	No
Floor tiles	☑	☐
Ceiling tiles	☑	☐
Carpet mastic	☐	☑
Transite siding	☐	☑
Pipe and duct insulation in basement	☐	☑
Insulation on interior walls	☐	☑
Vapor barrier under siding	☐	☑
Roofing materials	☐	☑
Plaster ceiling	☑	☐
Plaster/"stucco walls"	☐	☑
Sheetrock	☐	☑
Sheetrock spackle	☐	☑

Other sources of potential ACM:

TILE MASTIC

Is there evidence of possible mold? Where? ☐ Yes ☑ No

Will the installation require a licensed asbestos abatement contractor? ☑ Yes ☐ No

Will the installation require a licensed electrical contractor? ☑ Yes ☐ No

Is roofing required? ☐ Yes ☑ No

Is new concrete required? ☐ Yes ☑ No

Quantities of potential ACM to be removed for installation:

~2 SQ.FT FLOOR TILE.

Results of asbestos/mold analysis and comments:

FLOOR TILE IS POSITIVE FOR ASBESTOS. CEILING TILE IS NEGATIVE FOR ASBESTOS

O'BRIEN & GERE

Initial Design Visit Checklist

Structure Address: 33 Fulton St. Poughkeepsie NY   **Date of Design Visit:** 10/5/05

Structure ID #: Stargas

Design Team: EA/NJ

Diagnostic Communication Test Results

Test Point Location	Sub-slab Pressure - Vacuum Off ("Hg.)	Sub-slab Pressure - Vacuum On ("Hg.)	Sub-slab Pressure Differential ("Hg.)
1-A	0.000	-0.008	-0.008
1-B	0.000	-0.006	-0.006
1-C	0.000	-0.045	-0.045
1-D	0.000	-0.067	-0.067
2-A	0.000	-0.062	-0.062
2-B	0.000	-0.057	-0.057
2-C	0.000	-0.044	-0.044
2-D	0.000	-0.014	-0.014

Initial Backdraft Test Checklist

Was an initial backdraft test performed? ☑ Yes ☐ No

On what combustion appliances was a backdraft test performed? ☑ Hot Water Heater ☐ Furnace / Boiler ☐ Dryer
Other:

Is there is an existing backdraft on any appliance? ☐ Yes ☑ No
(If yes, explain)

NA

Were winter conditions simulated during tests? ☑ Yes ☐ No
(Doors/windows closed, heating appliances running)

Was there precipitation during the previous 24 hours? ☑ Yes ☐ No

What is the appearent wind speed? ☑ Calm ☐ Light ☐ Strong

Documentation Checklist

Were digital photographs taken of existing conditions (pre-installation)? ☑ Yes ☐ No

Is there visual pre-existing structure damage? ☐ Yes ☑ No

Was the site cleaned-up and left as found? ☑ Yes ☐ No

Comments:

FURNACE APPEARS TO BE A DIRECT VENT UNIT. DURING INSTALLATION CTSH 2 SHOULD BE USED AS A SYSTEM SUCTION POINT. INSTALLATION CREW SHOULD INSTALL AND CAP (NO GLUE AT FIRST) A TEE IN-LINE INCASE CTSH 1 NEEDS TO BE USED AS A SYSTEM SUCTION POINT. UPON INSTALLATION OF THE FIRST SYSTEM SUCTION POINT, COMMUNICATION TESTING SHOULD TAKE PLACE TO DETERMINE IF THE INSTALLATION OF THE ADDITIONAL SYSTEM SUCTION POINT IS NECESSARY.

Attachment B
Laboratory Results of Asbestos Analysis

AMERISCI

AmeriSci New York
117 EAST 30TH STREET
NEW YORK, NY
TEL: (212) 679-8600 • Fax: (212) 679-8392

PLM Bulk Asbestos Report

O'Brien & Gere Engineers, Inc.
Attn: Nick Janosky
5000 Brittonfield Parkway
East Syracuse, NY 13057

Date Received 10/10/05
Date Examined 10/12/05
ELAP Number 11480
RE 35919-004.010; Duso-Stargas ; Duso Vapor Instrusion IRM

AmeriSci Job No.205102147
P.O. # 35919-004.010
Page 1 of 3

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
Stargas-1A 1	205102147-01 **Location:** Outside Bathroom/ 12" Floor Tile	Yes	< 1.% [1]

Description: Grey, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile Trace
Other Material: Non-fibrous 8.7 %

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
Stargas-2A 1	205102147-02 **Location:** Front Office/ 12" Floor Tile	Yes	2.5 % [1]

Description: Grey, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 2.5 %
Other Material: Non-fibrous 14.2 %

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
Stargas-3A 1	205102147-03 **Location:** Front Door/ 12" Floor Tile		NA/PS

Description: Bulk Material
Asbestos Types:
Other Material:

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
Stargas-4A 1	205102147-04 **Location:** Front Window/ 12" Floor Tile		NA/PS

Description: Bulk Material
Asbestos Types:
Other Material:

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
Stargas-5A 1	205102147-05 **Location:** 12" Floor Tile		NA/PS

Description: Bulk Material
Asbestos Types:
Other Material:

AmeriSci New York
117 EAST 30TH STREET
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-9392

PLM Bulk Asbestos Report

O'Brien & Gere Engineers, Inc.
Attn: Nick Janosky
5000 Brittonfield Parkway
East Syracuse, NY 13057

Date Received 10/10/05 **AmeriSci Job No.** 205102147
Date Examined 10/12/05 **P.O. #** 35919-004.010
ELAP Number 11480 **Page** 2 of 3
RE 35919-004.010; Duso-Stargas ; Duso Vapor Instrusion IRM

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
Stargas-6A	205102147-06	*No*	NAD

Location: Back Of Office/ 12" Ceiling Tile
Description: Tan, Homogeneous, Fibrous, Bulk Material
Asbestos Types:
Other Material: Cellulose 90. %, Non-fibrous 10. %

Stargas-1B 2	205102147-07	*No*	NAD [1]

Location: Outside Bathroom/ 12" Floor Tile Mastic
Description: Black, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 8.2 %

Stargas-2B 2	205102147-08	*No*	NAD [1]

Location: Front Office/ 12" Floor Tile Mastic
Description: Black, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 4.3 %

Stargas-3B 2	205102147-09	*No*	NAD [1]

Location: Front Door/ 12" Floor Tile Mastic
Description: Black, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 9.6 %

Stargas-4B 2	205102147-10	*No*	NAD [1]

Location: Front Window/ 12" Floor Tile Mastic
Description: Black, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 2.6 %

AMERISCI

AmeriSci New York
117 EAST 30TH STREET
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-9392

PLM Bulk Asbestos Report

O'Brien & Gere Engineers, Inc.
Attn: Nick Janosky
5000 Brittonfield Parkway
East Syracuse, NY 13057

Date Received 10/10/05
Date Examined 10/12/05
ELAP Number 11480
RE 35919-004.010; Duso-Stargas ; Duso Vapor Instrusion IRM

AmeriSci Job No.205102147
P.O. # 35919-004.010
Page 3 **of** 3

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
Stargas-5B 2	205102147-11	*No*	NAD [1]

Location: Separator Door/ 12" Floor Tile Mastic

Description: Black, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 12. %

Reporting Notes:
(1) PLM analysis of NOB Inert material.

Analyzed by: Bella J. Chemis Bella Chemis

*NAD/NSD =no asbestos detected;NA =not analyzed; NA/PS=not analyzed/positive stop;PLM Bulk Asbestos Analysis by EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab #200546-0) and ELAP PLM Analysis Protocol 198.1 for New York friable samples and 198.6 for NOB samples (NYSDOH ELAP Lab#11480);Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile,FR 59,146,38970,8/1/94). National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab. This PLM report relates ONLY to the items tested. AIHA# 102843.

Reviewed By:________________________

Please Reply To:

AMERI SCI

AmeriSci New York
117 EAST 30TH STREET
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-9392

FACSIMILE TELECOPY TRANSMISSION

To: Nick Janosky
O'Brien & Gere Engineers, Inc.
Fax #: (315)463-7554

Email:

Date: Wednesday, October 12, 2005
Time: 13:38:08
Comments:

From: Bella J. Chernis
AmeriSci Job #: 205102147
Subject: ELAP-PLM/TEM 48 hour Results
Client Project: 35919-004.010; Duso-Stargas : Duso Vapor Instrusion IRM

Number of Pages: 6
(including cover sheet)

AmeriSci Job #: 205102147

Client Name: O'Brien & Gere Engineers, Inc.

Table I

Summary of Bulk Asbestos Analysis Results

35919-004.010; Duso-Stargas ; Duso Vapor Instrusion IRM

AmeriSci Sample #	Client Sample# Location	HG Area	Sample Weight	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	Stargas-1A Outside Bathroom/ 12" Floor Tile	1	0.217	20.74	70.51	7.76	Chrysotile Trace	NA
02	Stargas-2A Front Office/ 12" Floor Tile	1	0.275	24.73	58.55	14.23	Chrysotile 2.5	NA
03	Stargas-3A Front Door/ 12" Floor Tile	1	0.182	27.47	53.85	18.68	NA/PS	NA
04	Stargas-4A Front Window/ 12" Floor Tile	1	0.226	25.66	58.85	15.49	NA/PS	NA
05	Stargas-5A 12" Floor Tile	1	0.181	21.55	69.61	8.84	NA/PS	NA
06	Stargas-6A Back Of Office/ 12" Ceiling Tile		—	----	----	----	NAD	NA
07	Stargas-1B Outside Bathroom/ 12" Floor Tile Mastic	2	0.207	79.23	12.56	8.11	NAD	Chrysotile Trace
08	Stargas-2B Front Office/ 12" Floor Tile Mastic	2	0.115	85.22	10.43	4.35	NAD	NAD
09	Stargas-3B Front Door/ 12" Floor Tile Mastic	2	0.093	69.89	20.43	9.43	NAD	Chrysotile <1.0
10	Stargas-4B Front Window/ 12" Floor Tile Mastic	2	0.113	84.07	13.27	2.55	NAD	Chrysotile Trace

See Reporting notes on last page

AmeriSci Job #: 205102147

Client Name: O'Brien & Gere Engineers, Inc.

Table I

Summary of Bulk Asbestos Analysis Results

35919-004.010; Duso-Stargas ; Duso Vapor Instrusion IRM

AmeriSci Sample #	Client Sample# Location	HG Area	Sample Weight	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
11	Stargas-5B Separator Door/ 12" Floor Tile Mastic	2	0.05	58.00	30.00	11.90	NAD	Chrysotile Trace

Analyzed by: Aleksandr Barengolts________________; Date Analyzed 10/12/2005

Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by EPA 600/M4-82-020 per 40 CFR (NVLAP Lab#200546-0); TEM (Semi/Full) by EPA 600/R-93/116 (not covered by NVLAP Bulk accreditation); or ELAP 198.4 for New York samples (NYSDOH ELAP#11480); NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses); AIHA Lab#102843. NVLAP# 200546-0

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By:________________

205102147

O'BRIEN & GERE ENGINEERS, INC.

Asbestos Bulk Sample Chain of Custody

Requested Turn Around Time:	48 hour	Project Number:	35919 -004.010
Client Name:	Duso- Stangas	Sample Date:	10/5/05
Project Name:	Duso Vapor Intrusion IRM	Sampled By:	Nick Janosky
Building:	Stangas	Page Number:	1 of 1

SAMPLE NUMBER	FLOOR	SAMPLE LOCATION	SAMPLE DESCRIPTION	NOB Y/N	POSITIVE STOP*
Stangas-1A	1	outside bathroom	12" floor tile	Y	*
Stangas-2A	1	front office	12" floor tile	Y	*
Stangas-3A	1	front door	12" floor tile	Y	*
Stangas-4A	1	front window	12" floor tile	Y	*
Stangas-5A	1	12" floor tile	12" floor tile	Y	*
Stangas-6A	1	back of office	12" ceiling tile	N	
Stangas-1B	1	outside bathroom	12" floor tile Mastic	Y	*
Stangas-2B	1	front office	12" floor tile Mastic	Y	*
Stangas-3B	1	front door	12" floor tile Mastic	Y	*
Stangas-4B	1	front window	12" floor tile Mastic	Y	*
Stangas-5B	1	separator door	12" floor tile Mastic	Y	*

* Samples identified with numbered sequence in this column are categorized with "Positive Stop" analysis. Perform sequential analysis until a positive result is obtained (i.e. > 1% asbestos content). After a positive result is obtained, "STOP"; do not analyze the next samples in the series.

~~[illegible]~~

Received By: [illegible] 10/10/05 1100

I:\DIV59\DIVISION\Asbestos\Forms\BulkCOC template-MultiPage.doc

O'BRIEN & GERE ENGINEERS, INC.

Asbestos Sample Submission Form

Job Number: 35919-004-010

*205102147

Client Name: Duso - Stangas

Manager's Signature: [signature]

Project Name: ~~Stangas Building~~ Duso Vapor Intrusion IRM

Division: 71

Building: Stangas

Sample Date: 10/5/05

Herein find the following samples to be analyzed as indicated:	No.	Unit Price	Total
☐ PCM Air Samples			
☐ TEM Air Samples			
☒ PLM Standard Bulk Samples	1	7.00	7.00
☒ NOB Bulk Samples – Prep (Matrix Reduction) and PLM	10	37.00	370.00
☒ NOB Bulk Samples – TEM*	10		
☐ Other:			
(*As required, if PLM-MR analysis is negative.)		Grand Total	377.00
Prices Accepted by Laboratory (Signature)			

Total Number of Samples Shipped: 11

Total Number of Samples Received 11

ATTACH ASBESTOS BULK SAMPLE CHAIN OF CUSTODY

DO NOT SEND TO JOHN SHAHE

PLEASE TO NICK JANOSKY

Report Results:

Verbal to: Nick Janosky By: 10-11-05 Phone: 315-437-6100 (x2681)

Written to: Nick Janosky By: 10-11-05

After Analysis:

☐ Return Samples
☐ Retain for ___ days, then dispose
☒ Dispose Samples

Received By: [signature] 10/10/05 1100

C:\Wpdata\asbsmplsubfrm-nodiscl.doc

Attachment C
Example Commissioning Field Data Sheets

O'BRIEN & GERE

Installation and Operation Commissioning Checklist

Structure Address: ______________________________ **Date of Commissioning Visit:** __________

Structure ID #: ______________________________

Commissioning Engineer Team: ______________________________

System Performance Data

Fan Inlet Static Pressure (vacuum)

Fan System	1	2	3	4	5
Fan Model					
U-Tube Reading ("w.g)					

Is each fan mounted securely? ☐ Yes ☐ No

SSP Static Pressure (vacuum)

SSP#	Static Pressure ("w.g.)	Fan System

Final Communication Test Results

Communication test point							
Manometer reading ("w.g.)							
Distance to closest SSP (ft.)							

Communication test point							
Manometer reading ("w.g.)							
Distance to closest SSP (ft.)							

Were all fans in operation during final communication test? ☐ Yes ☐ No

Were all valves locked prior to final communication test? ☐ Yes ☐ No ☐ NA

Was the pressure reading at each test point ≤ -0.002"w.g.? ☐ Yes ☐ No

Were winter conditions simulated during test? ☐ Yes ☐ No

Was there precipitation during the previous 24 hours? ☐ Yes ☐ No

What was the apparent wind speed? ☐ Calm ☐ Light ☐ Strong

Accessible Crawlspace Performance Inspection

Was each membrane joint and perimeter smoke tested and found to be sealed? ☐ Yes ☐ No ☐ NA

Inaccessible Crawlspace Data ☐ NA

	Crawlspace 1	Crawlspace 2	Crawlspace 3	Crawlspace 4
SSP#				
Crawlspace volume (ft^3)				
Suction pipe diameter (in.)				
Measured velocity (fpm)				
Flow rate out of crawlspace (cfm)				
Number of air exchanges				
Meets criteria (Yes/No)				

Backdraft Test Results

Was commissioning backdraft test performed? ☐ Yes ☐ No

On what combustion appliances was a backdraft test performed? ☐ Hot Water Heater ☐ Furnace / Boiler ☐ Dryer
Other: ____________________

Is there is a backdraft on any appliance? ☐ Yes ☐ No
(If yes, explain)*

____

____

*If backdraft exists, please notify the property owner.
Owner was notified on: (date) _________

Electrical System Installation Inspection

Are all electrical connections secure? ☐ Yes ☐ No

Are all switches locked on? ☐ Yes ☐ No

Electric meter # ____________________

Pipe System Performance

Are all pipe runs properly supported? ☐ Yes ☐ No

Were 10% of all pipe joints smoke tested? ☐ Yes ☐ No

Are manometers installed at each suction point? ☐ Yes ☐ No

Slab/Wall Repair Performance

Was each identified slab/wall crack repair smoke tested? ☐ Yes ☐ No ☐ NA

Labeling Inspection

Are the appropriate labels applied in the proper locations? ☐ Yes ☐ No

System Design

Are all vent pipe exhausts installed: ☐ Yes ☐ No

Above the eave of the roof? ☐ Yes ☐ No

At least 10 ft above ground level? ☐ Yes ☐ No

At least 10 ft away from any adjoining or adjacent buildings, or structure opening or HVAC intake? ☐ Yes ☐ No

Documentation

Were digital photographs taken of post-installation conditions? ☐ Yes ☐ No

Comments:

APPENDIX F.4

Former Duso Chemical Facility IRM
Sub-Slab Depressurization
System Installation
Star Gas Products

Field Data Forms

O'BRIEN & GERE

Installation and Operation Commissioning Checklist

Structure Address: 33 FULTON ST

Date of Commissioning Visit: 2/7/06

Structure ID #:

Commissioning Engineer Team: EA

System Performance Data

Fan Inlet Static Pressure (vacuum)

Fan System	1	2	3	4	5
Fan Model	GP-501	–	–	–	–
U-Tube Reading ("w.g)	4.0"	–	–	–	–

Is each fan mounted securely? ☑ Yes ☐ No

SSP Static Pressure (vacuum)

SSP#	Static Pressure ("w.g.)	Fan System
1	3.75"	1
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–

Final Communication Test Results

Communication test point	A	B	C	D	–	–	–
Manometer reading ("w.g.)	-0.012	-0.028	-0.015	-0.017	–	–	–
Distance to closest SSP (ft.)					–	–	–

Communication test point	–	–	–	–	–	–	–
Manometer reading ("w.g.)	–	–	–	–	–	–	–
Distance to closest SSP (ft.)	–	–	–	–	–	–	–

Were all fans in operation during final communication test? ☑ Yes ☐ No

Were all valves locked prior to final communication test? ☑ Yes ☐ No ☐ NA

Was the pressure reading at each test point ≤ -0.002"w.g.? ☑ Yes ☐ No

Were winter conditions simulated during test? ☑ Yes ☐ No

Was there precipitation during the previous 24 hours? ☐ Yes ☑ No

What was the apparent wind speed? ☐ Calm ☑ Light ☐ Strong

Accessible Crawlspace Performance Inspection

Was each membrane joint and perimeter smoke tested and found to be sealed? ☐ Yes ☐ No ☑ NA

Inaccessible Crawlspace Data ☑ NA

	Crawlspace 1	Crawlspace 2	Crawlspace 3	Crawlspace 4
SSP#				
Crawlspace volume (ft^3)				
Suction pipe diameter (in.)				
Measured velocity (fpm)				
Flow rate out of crawlspace (cfm)				
Number of air exchanges				
Meets criteria (Yes/No)				

Backdraft Test Results

Was commissioning backdraft test performed? ☑ Yes ☐ No

On what combustion appliances was a backdraft test performed? ☑ Hot Water Heater ☑ Furnace / Boiler ☐ Dryer

Other: ______

Is there is a backdraft on any appliance? ☐ Yes ☑ No
(If yes, explain)*

NA

*If backdraft exists, please notify the property owner.
Owner was notified on: (date) ______

Electrical System Installation Inspection

Are all electrical connections secure? ☑ Yes ☐ No

Are all switches locked on? ☑ Yes ☐ No

Electric meter # 38 642 158

Pipe System Performance

Are all pipe runs properly supported? ☑ Yes ☐ No

Were 10% of all pipe joints smoke tested? ☑ Yes ☐ No

Are manometers installed at each suction point? ☑ Yes ☐ No

Slab/Wall Repair Performance

Was each identified slab/wall crack repair smoke tested? ☐ Yes ☐ No ☑ NA

Labeling Inspection

Are the appropriate labels applied in the proper locations? ☑ Yes ☐ No

Electrical Permit Information

MONEY RECEIPT

No. 3933 2/6/06

Received of Eric Elongi

Twenty-five and no/100 —— Dollars

For CP# 34718 33 Fulton

Elec for Fan

$ 25 00/xx Beatrice Manning

TOPS. FORM 4161 Cash

RECEIPT SHOWING PROOF OF ELECTRICAL PERMIT APPLICATION WITH TOWN OF POUGHKEEPSIE

TRI - STATE INSPECTION AGENCY INC.

Electrical Inspection

P.O. BOX 1034 • WARWICK, NY 10990 • 845-986-6514 • FAX 845-986-0535

265546

THIS QUESTION MUST BE ANSWERED:
Has this installation been reviewed by any other agency? ☐ Yes ☐ No

APPLICANT COMPLETES THIS SECTION Lot: Block: Section: Date: 2-7-06

City, Town or Township [illegible] County [illegible] State NY

Location/Address [illegible]

(if Located in Rural Area - Please Attach Directions)

Owner [illegible] Pole #

Occupied As Permit # [illegible]

Occupant Building: New ☐ Old ☒

Work Area in Building (Floor # etc.): 1st

App. for: Wiring ☐ Service ☐ or: Ready for Inspection:

Fee Remitted - $ Cash ☐ Check ☐ M.O. ☐

Number of Rough Wiring Outlets

Switches

Lighting

Receptacles

Number of Fixtures

Elect. Heat		500	750	1000	1250	1500	1750	2000	2250	2500	2600	2750	3000		

____ Amp. Service ____ Surface Unit ____ Dishwasher ____ Range
____ Water Heater ____ Air Conditioner Dryer ____ Pump
____ Oven ____ Garbage Disposal Wiring and Controls for ____ Burner
____ Amp. Receptacles ____ Fractional H.P. Vent Fans

Other Equipment [illegible]

MOTORS H.P. Mark Number of Each Size		1/20	1/12	1/10	1/8	1/6	1/4	1/3	1/2	3/4	1	1½	2	3	5	7½	10	15	20	25	30	40	50	75	100				

Applicant's Signature [illegible] License # Permit #

T/A Utility: (NAME) (OFFICE LOCATION)

Applicant's Address

(City) (State) (Zip) Service Request #

Phone # [illegible] Electrician:

CERTIFICATIONS	USE FOR INITIAL VISIT ONLY	NOTIFIED	DATE	CORRECT FEE	FEE PAID
☐ RW 2-7-06	Progress: Inc. ☐ LKD ☐	Contractor		100	100
☒ CFT 2/7/06	Violation: Work Comp. ☐ Inc. ☐	Owner		Fee Due	CASH ☒ CHK # MO #
RECAP COMP ☐		Municipal			INV. #
		Utility			Applicant ☐ Owner ☐

Cut in Card ☐ Temp # Date

☐ Final # Date

[illegible]
INSPECTOR'S SIGNATURE *

Ready for CO 2-7-06

*THIS APPLICATION EXPIRES SIX (6) MONTHS FROM DATE OF MOST RECENT INSPECTION.

Fan Specifications

RadonAway (DynaVac)

NEW PRODUCTS PRODUCT SPECIFICATIONS GENERAL INFO FAQ'S LINKS

GPx01 Series

Designed specially for radon mitigation, GPx01 Series Fans provide a wide range of performance that makes them ideal for most subslab radon mitigation systems. Choice of model is dependant on certain building characteristics and should be made by a radon professional.

Feel free to contact us at support@radonaway.com

View Fan Chart
Download Fan Installation Instructions (MS-Word Format)

newsletter library
fan replacement guide
epa zone map
credit application

Click Here to go back to PRODUCT SPECIFICATIONS for more fan models and information or see below for detailed info about this model.

Homeowner Referral Service
Find a Radon Professional

The following chart shows performance of **GPx01 Series** fans:

Model	*Watts	Maximum Pressure	Typical CFM vs Static Pressure WC" 1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP201	40-60	2.0" WC	82	58	5	-	-	-	-
GP301	55-90	2.6" WC	92	77	45	10	-	-	-
GP401	60-110	3.4" WC	93	82	60	40	15	-	-
GP501	70-140	4.2" WC	95	87	80	70	57	30	10

*Typical monthly electric cost $2.00 - $6.00 depending on model, electric rates & operating conditions.

- 5 - Year Warranty.
- Mounts on duct pipe or with integral flange.
- 3" diameter ducts for use with 3" or 4" Pipe.
- Rugged .125" noryl plastic housing.
- Electrical box for hard wire or plug in.
- ETL Safety Agency Listed - tested to UL Standard 507 for indoor or outdoor use. Meets all electrical code requirements.

Photos

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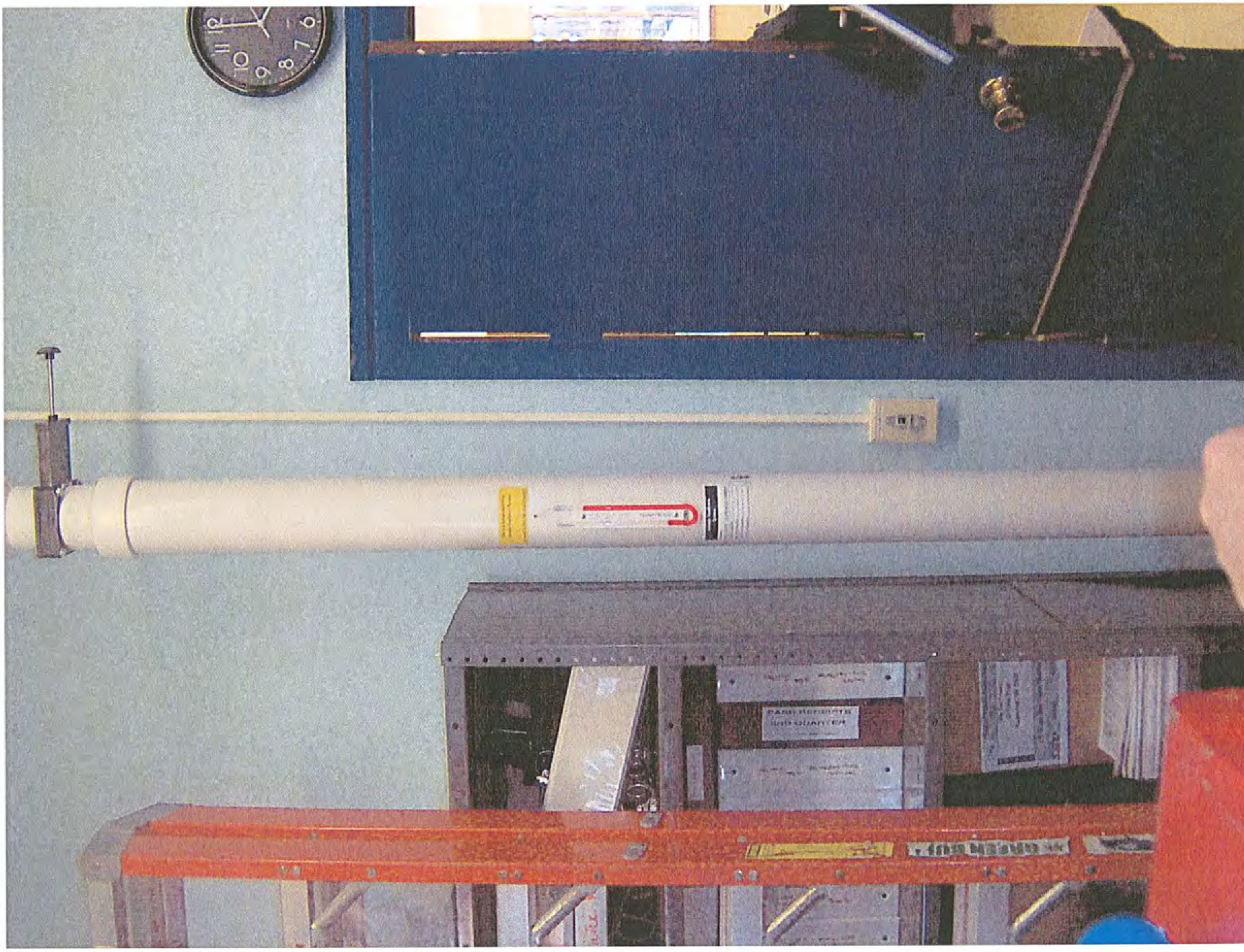

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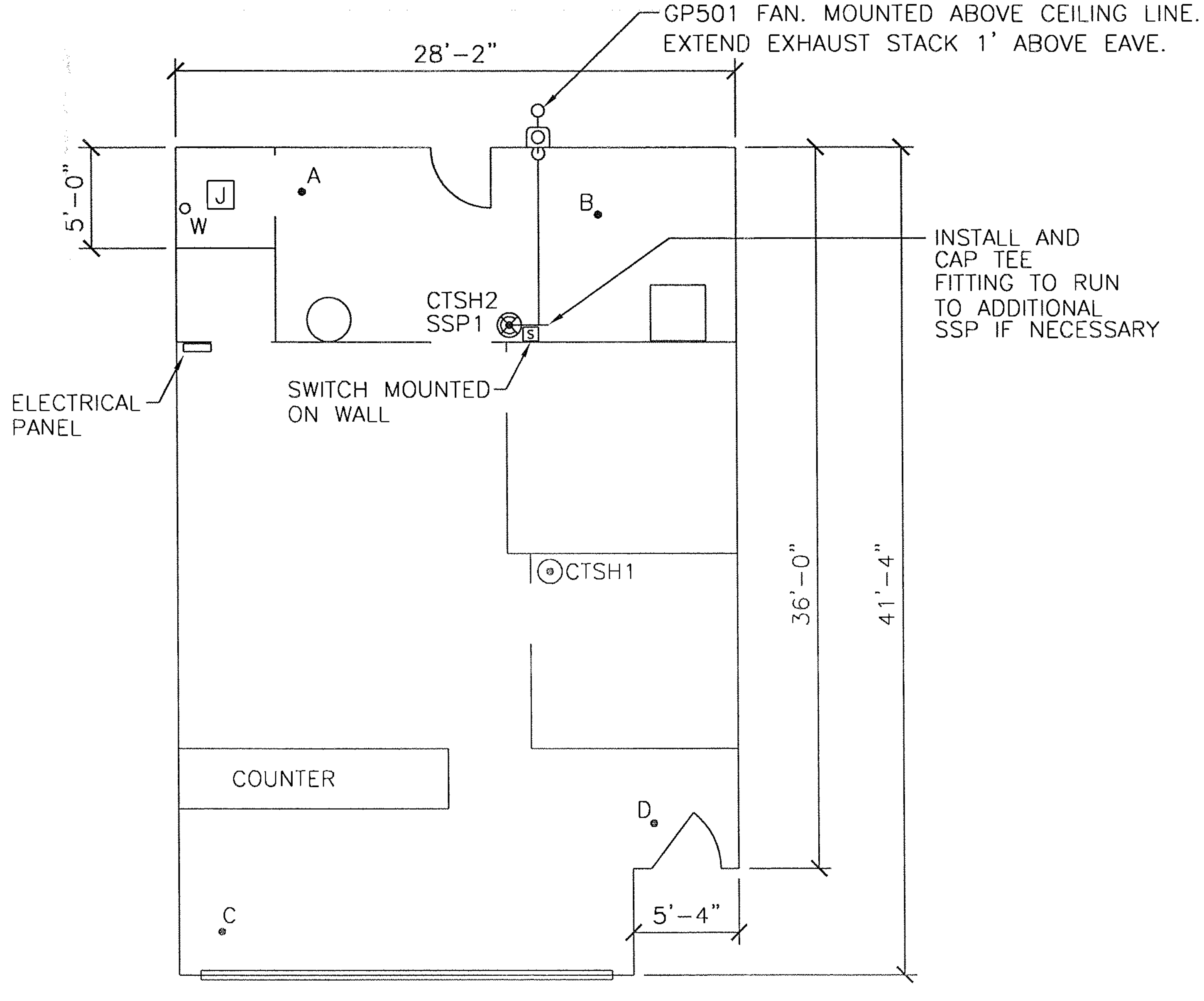
As-Built 02/07/06

DWG PATH: 35919\ASBUILT.DWG



FRONT OF BUILDING (FULTON STREET)

FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. DIMENSIONS SHOWN ON FIGURE ARE APPROXIMATE INSTALLATION LOCATIONS AND SHALL BE FIELD VERIFIED BY INSTALLATION CREW.
2. INSTALLATION CREW SHALL GROUT AND/OR CAULK ALL MAJOR CRACKS AND OPENINGS THAT WOULD IMPAIR VENTILATION SYSTEM PERFORMANCE.
3. INSTALLATION CREW SHALL DETERMINE ELECTRICAL TIE-IN LOCATION OF JUNCTION BOX.
4. INSTALLATION CREW SHALL SECURE EQUIPMENT AND PIPING TO PREVENT ANY MOVEMENT.
5. INSTALLATION CREW SHALL INSTALL A BLADEX VALVE ON EACH SYSTEM SUCTION POINT.
6. * DENOTES ASBESTOS SAMPLE IDENTIFICATION

ASBUILT 02/07/06

Plot Date: 10/19/05 EMA

FIGURE 1

LEGEND

S — SEWER
G — NATURAL GAS
W — WATER
E — ELECTRICAL
HVAC — HVAC DUCT
PIPE/DUCT DOWN
PIPE/DUCT UP
EXISTING WALL
WINDOW
DOOR
STAIRWAY
HOT WATER TANK (HWT)
BOILER
FURNACE
J JUNCTION BOX
S FAN SWITCH
CIRCUIT BREAKER PANEL
SUMP PUMP
FLOOR DRAIN
COMMUNICATION TEST SUCTION HOLE (CTSH)
COMMUNICATION TEST SUCTION HOLE AND SYSTEM SUCTION POINT
SYSTEM SUCTION POINT (SSP)
COMMUNICATION TEST POINT (CTP)
NEW EXHAUST RISER PIPE
NEW EXHAUST PIPE

FORMER DUSO CHEMICAL SITE
INTERIM REMEDIAL MEASURE

FIRST FLOOR PLAN
STAR GAS PRODUCTS

33 FULTON STREET
SITE NO. 3-14-103

8 0 8

1/8"=1'-0"

FILE NO. 35919.004
OCTOBER 18, 2005

O'BRIEN & GERE ENGINEERS INC.

Mitigation System Installation Record

[X] Structure was sampled previously

System Information

System ID: 314103-H-001

Owner Name: Star Gas Properties, Inc.

System Address: 33 Fulton Street

City: Poughkeepsie Zip: 12601

Site No: 314103

Site Name: Former Duso Chemical

[X] Owner Occupied

Telephone: (845) 452-8400

Alt. Telephone:

Contractor Information

Installer Name:

Company: O'Brien & Gere

Telephone:

Building Conditions

Building Type: General Industrial

Slab Integrity: ( ) Poor (•) Average ( ) Good ( ) Excellent

Slab Penetrations: [ ] Sump [ ] Floor drain [X] Perimeter drain [ ] Other

Describe:

Observed Water: (•) Dry ( ) Damp ( ) Sump only ( ) Standing

Describe:

System Installation

Installation Type: Sub-Slab Depressurization (Active)

Date Installed: Feb 6, 2006

Slab Thickess (inches): >5 in.

Subslab Material: Sand

Subslab Moisture:

Number of Suction Points: 2

Number of Fans Installed: 1

	[X] Fan #1 Operating	[ ] Fan #2 Operating	[ ] Fan #3 Operating
Fan Model No(s):	GP-501		
Fan Serial No(s):			
Final U-Tube Levels:	4.0 in H20		

Additional Mitigation Elements (check all that apply):

[ ] Drainjer [ ] Membrane [ ] Sealed cracks [ ] New floor [ ] Rain cap [ ] Other

Comments:

Communication Testing

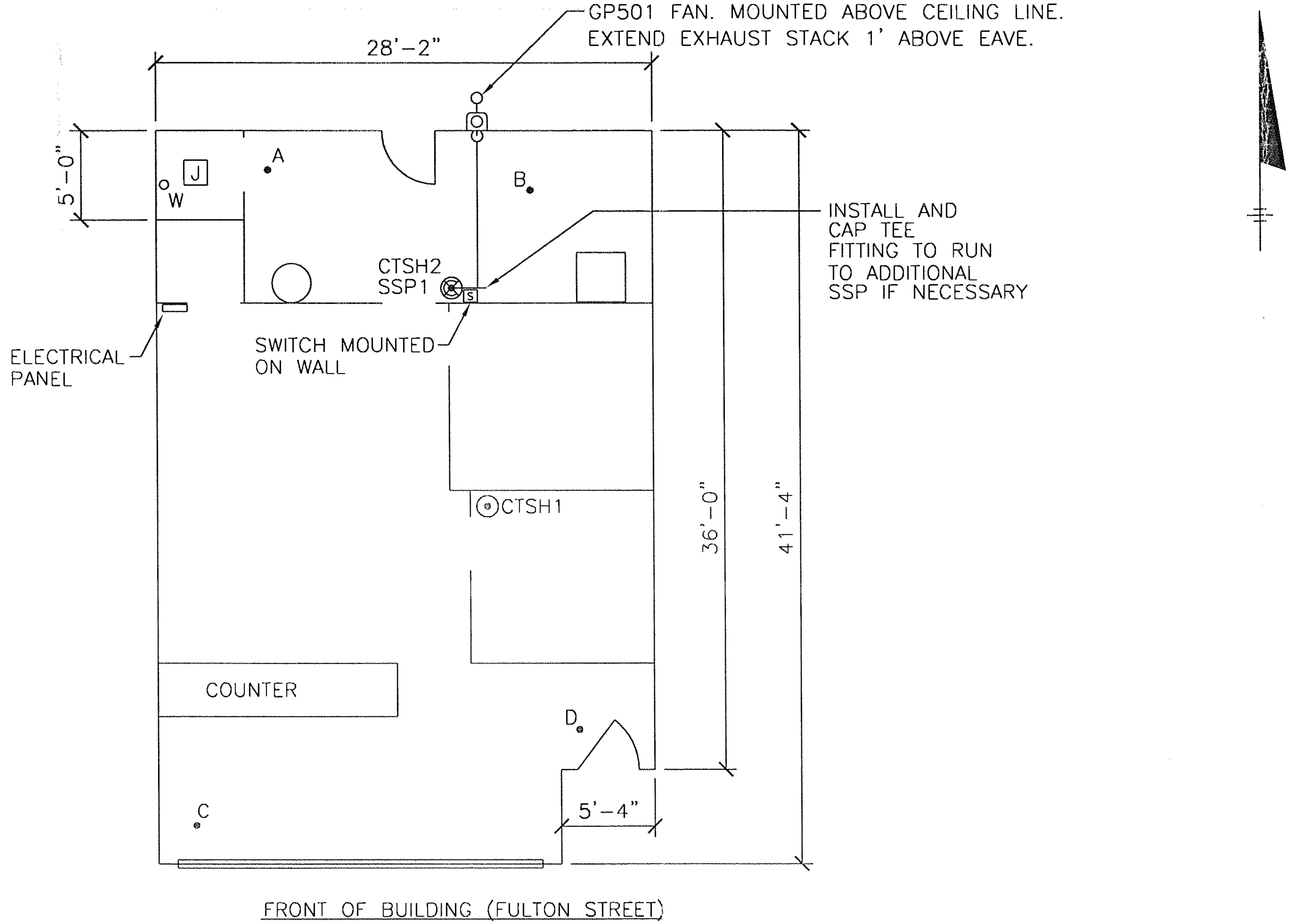
Test Method: Micromanometer

Meter Type/Manufacturer: ____________________

Location	Reading/Result	Dist. From Suction Point (ft)	Passed?
A	-0.012 inches of H20		☒
B	-0.028 inches of H20		☒
C	-0.015 inches of H20		☒
D	-0.017 inches of H20		☒
			☐

NORTH	**System Sketch** (indicate notable features, location of extraction points, and communication test holes)

DWG PATH: 35919\ASBUILT.DWG



FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

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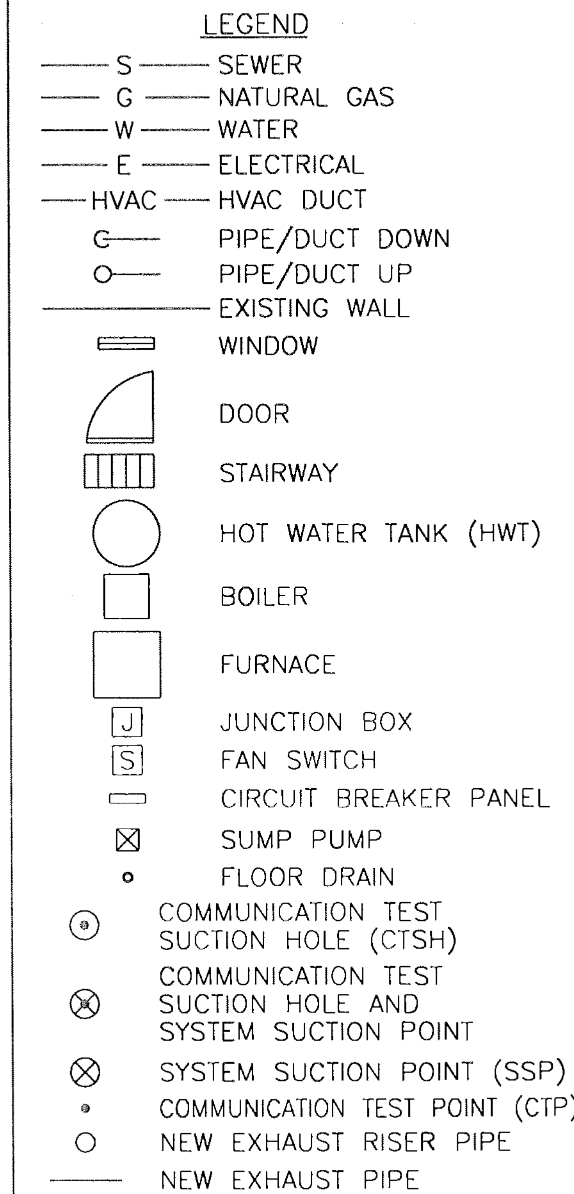
5. INSTALLATION CREW SHALL INSTALL A BLADEX VALVE ON EACH SYSTEM SUCTION POINT.
6. * DENOTES ASBESTOS SAMPLE IDENTIFICATION

ASBUILT 02/07/06

Plot Date: 10/19/05 EMA

FIGURE 1



FORMER DUSO CHEMICAL SITE
INTERIM REMEDIAL MEASURE

FIRST FLOOR PLAN
STAR GAS PRODUCTS

33 FULTON STREET
SITE NO. 3-14-103

8 0 8
1/8"=1'-0"

FILE NO. 35919.004
OCTOBER 18, 2005

O'BRIEN & GERE ENGINEERS INC.

September 14, 2016

Richard Muellerleile
33 Fulton Street
Poughkeepsie, NY 12601

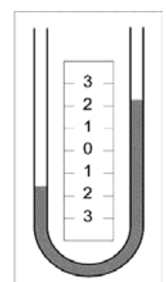
RE: Routine Operations of Vapor Mitigation System
Annual Letter
33 Fulton Street; System ID: 314103-H-001
Site Name: Former Duso Chemical; Site Code: 314103

Dear Property Owner:

This letter is being sent to provide you with information regarding the ventilation system that the New York State Department of Environmental Conservation (DEC) installed, or is responsible for maintaining, at the property referenced above. The DEC is maintaining the system as part of the ongoing remediation of the Former Duso Chemical site. If you have any questions regarding the information contained in this letter, please refer to the Vapor Intrusion Mitigation System Owner's Manual (Manual) that was left at the address during the last system inspection visit, or call Mr. Eric Hausamann at the DEC's toll-free number: 888-459-8667.

The ventilation system installed on your property draws air from beneath the building and vents it to the outdoor air above the roofline to prevent subslab vapors from potentially entering your building (see the attached schematic diagram at the end of this letter). The primary system components include:

- An electrically-powered exhaust fan mounted on the outside of your home/building. The exhaust fan should operate on a continuous basis.
- Vacuum gauges ("U-tubes") attached at one or more suction points (pipe entering the basement floor). The levels of the liquid in the U-tube(s) should be uneven as shown to the right.
- Labels identifying the system and providing contact information.



UNEVEN LEVELS INDICATE SYSTEM IS OPERATING

While the system is designed to operate continuously, it is important that it be inspected periodically by the building owner or occupant. There may be instances when the system needs to be repaired or modified. If the exhaust fan is not operating, the occupant should refer to the Manual for tips to troubleshoot the issue. In any of the following situations, please contact the DEC at the toll-free number listed above and on the system label:

- If the exhaust fan is not operating or is making excessive, unusual noise;
- If the liquid levels in any U-tube are even (no difference in levels);
- If any new construction or structural changes occur that affect the footprint of the building or the basement or crawl space including penetrations through the slab;
- If there is standing water or flooding observed in the basement;
- If any new combustion appliance or exhaust system is installed; or
- If the property is sold.

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

HDR

HDR has been retained by the DEC to coordinate maintenance activities associated with ventilation systems like the one at your property. You are responsible for periodically checking to see that the system is operating and informing the DEC or HDR if it is not running properly. In the meantime, should you have any questions about the system or the information included in the Manual, please feel free to contact me. My contact information is provided below.

HDR, Inc.
Attn: Michael P. Musso, P.E.
1 International Boulevard
10th Floor, Suite 1000
Mahwah, NJ 07495
Phone: 201-335-9300
Email: michael.musso@hdrinc.com

Note that Environmental Conservation Law Section 27-2405 (Tenant Notification Law) directs property owners or owners' agents to provide fact sheets and notices of public meetings to all tenants and occupants of structures for which test results exceed DOH indoor air guidelines or OSHA standards, and, upon request, to make test results available within 15 days of the owner's receipt of the results. In addition, when a property is subject to an engineering control to mitigate indoor air contamination or is subject to ongoing monitoring, the Tenant Notification Law requires an owner or owner's agent to provide prospective tenants with fact sheets and, upon request, test results prior to the signing of a lease or rental agreement. The notice that the property has been tested for indoor air contamination must appear prominently in the lease or rental agreement. Information regarding property owners' obligations regarding indoor air contamination associated with VI is available on DEC's website:

http://www.dec.ny.gov/regulations/55739.html

Fact sheets are available on the New York State Department of Health's website:

http://www.health.ny.gov/environmental/indoors/air/contaminants/

If you are not a resident or occupant of the building, please pass along this information to your tenant(s) or kindly let me know who we should contact. Thank you again for your cooperation.

Respectfully submitted on behalf of the DEC,

Henningson, Durham & Richardson
Architecture and Engineering, P.C.
In association with HDR Engineering, Inc.

Michael P. Musso, P.E.

Michael P. Musso, P.E.
Project Manager

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

HDR

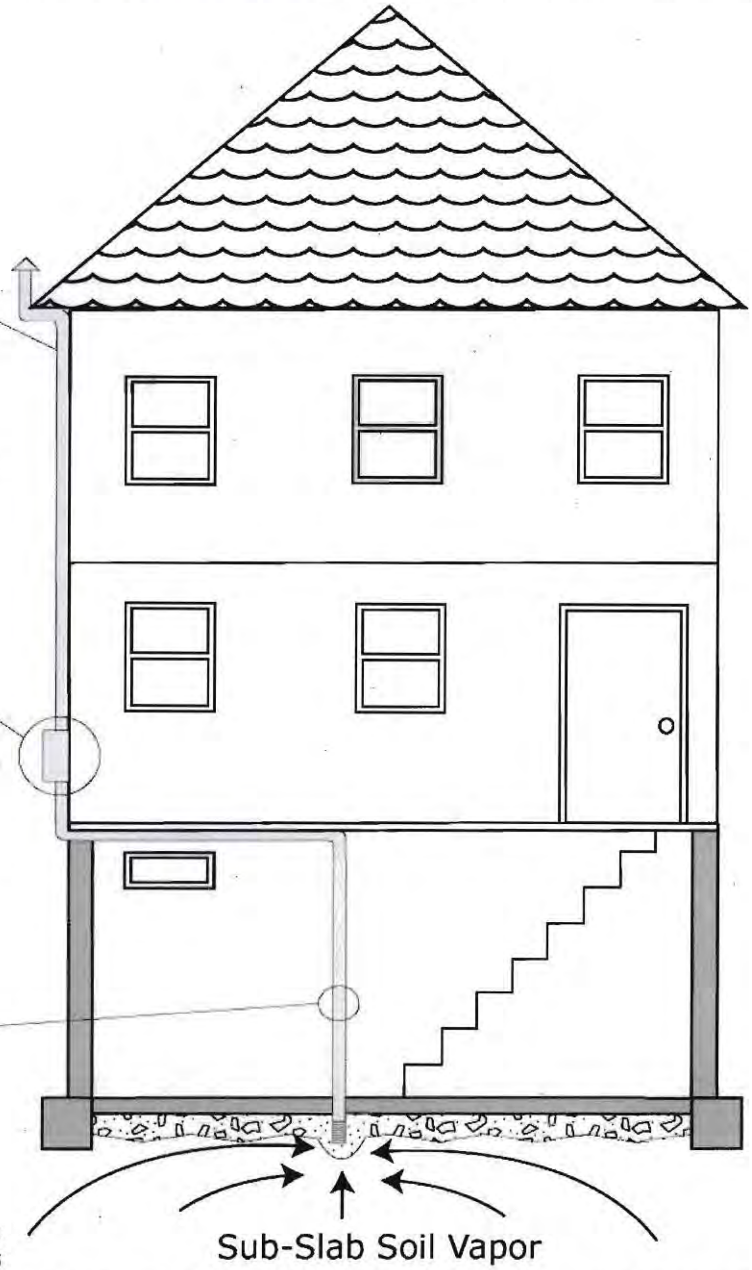
Sub-Slab Depressurization System

(commonly called a radon mitigation system)

The vent pipe is routed up the side of the structure to a location above the roof line.

A fan is used to draw soil vapor from beneath the slab.

A liquid gauge, or manometer is used to verify that the system is operating properly



A sub-slab depressurization system vents contaminated soil vapor before it enters a structure. The fan draws vapor from beneath the building outside to the roof line where it is released to the outside air.

AECOM Technical Services Northeast, Inc.		**PHOTOGRAPHIC LOG**
Client Name: NYSDEC	**Site Location:** Former Duso Chemical Site, Town of Poughkeepsie, Dutchess County, New York	**Project No.** 60322591

Photo No. **1**

Date: 11-14-17

Direction Photo Taken:

Not applicable

Description:

U-Tube Manometer of SSDS in Star Gas Products, Inc. Office Building.

Photo No. **2**

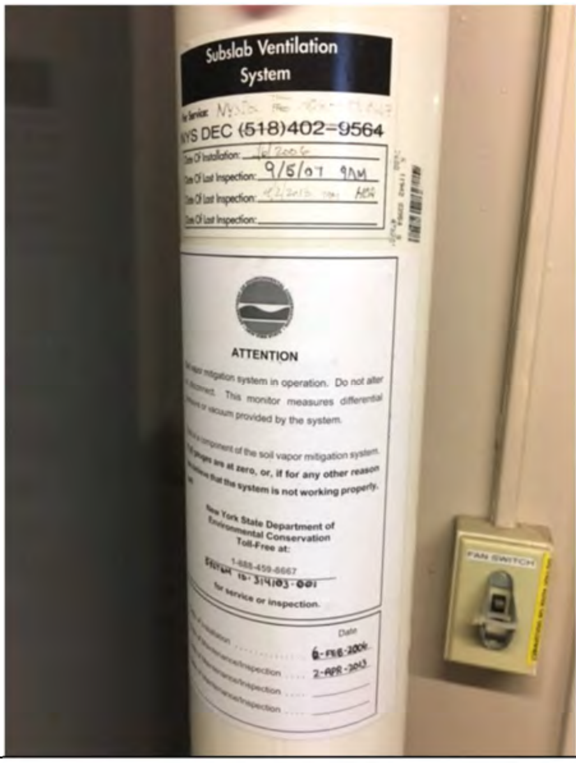
Date: 11-14-17

Direction Photo Taken:

Not applicable

Description:

Certification of SSDS in Star Gas Products, Inc. Office Building.



WHERE CAN I GET MORE INFORMATION ABOUT MITIGATION SYSTEMS?

Because vapor mitigation systems and radon mitigation systems are similar, the "Consumer's Guide to Radon Reduction" is a good place to obtain more detailed information about the topic. (See U. S. EPA Office of Air and Radiation, Office of Radiation and Indoor Air (6609J) 402-K-03-002, revised February 2003, or visit their website: http://www.epa.gov/iaq/radon/pubs/consguid.html#installtable).

CONTACTS

To report problems with your system:*
New York State Department of Environmental Conservation (DEC)
Statewide Inspection & Maintenance Program
1-(888)-459-8667
derweb@gw.dec.state.ny.us

**Contact the DEC if you sell or intend to sell the property*

For health-related questions:
New York State Department of Health (NYSDOH)
Bureau of Environmental Exposure Assessment
1- (800) 458-1158 ext. 27850
BEEI@health.state.ny.us

SYSTEM INFORMATION

When contacting the DEC, please provide the following information about your system:

Street Address/Zip Code: ______________________________

Date Installed: ______________________________________

Installed By: ____

System ID: ____________________________

VAPOR INTRUSION MITIGATION SYSTEM OWNER'S MANUAL

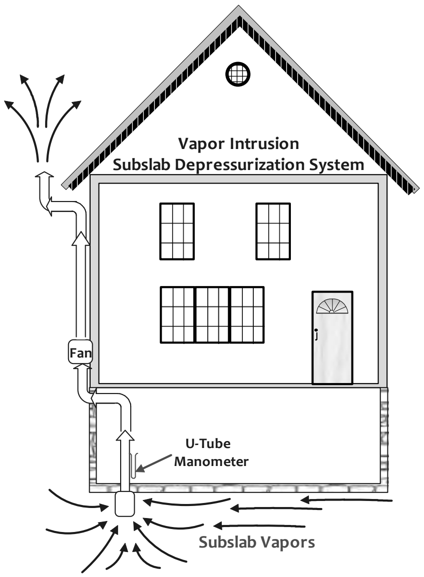
Your home's *Vapor Intrusion Mitigation System* was installed by the New York State Department of Environmental Conservation (DEC). The system is designed to mitigate potential human exposures to volatile organic compounds (VOCs) detected in the air beneath the building foundation (called subslab vapor).

It is important that you notify the DEC if you believe your system is not working properly. The DEC will make repairs to the system as needed, but we rely on you to keep us informed about its operation. You should expect to receive annual letters from the DEC reminding you to check your mitigation system for any problems. If you have any questions about the system or if you suspect that it is not working properly, contact the DEC at the following toll-free number:

1-(888)-459-8667

HOW DO MITIGATION SYSTEMS WORK?

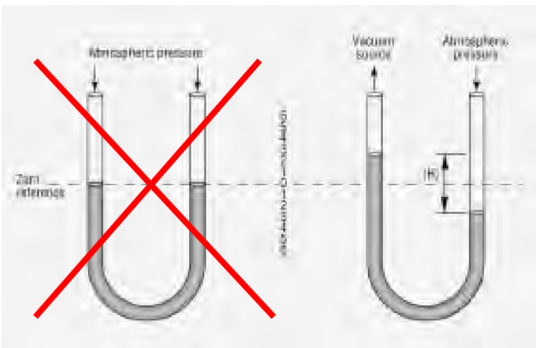
Your mitigation system includes one or more small fans and suction pipes that are used to maintain a zone of negative pressure (a vacuum) below the house. The pipes capture soil vapors and redirect them to a point above the roof. The diagram to the right illustrates these concepts based on a "typical" mitigation system.



In order for the mitigation system to be effective, it should run continuously.

HOW WILL I KNOW IF MY MITIGATION SYSTEM IS WORKING PROPERLY?

At the time of installation, pressure and flow tests were performed to confirm that the mitigation system was working properly. The system includes a liquid gauge or "U-tube manometer" installed inside your house along the vertical section of pipe which is used to monitor the system vacuum. Every so often (at least twice a year), check to make sure the manometer levels indicate that a vacuum is being applied. The levels should be unequal, as shown in the diagram to the right. If they are equal, it means that the system may not be operating properly and you should contact the DEC.



Not Working *Working*

Some systems also include a warning device (a light or alarm) that lets the owner know that the system is not operating properly. In the event that the system stops working properly, contact the DEC at:

1-(888)-459-8667

WHAT HAPPENS IF MY SYSTEM SHUTS DOWN DURING A POWER OUTAGE?

Your system should restart when power is restored. If not, locate your electrical panel and check to make sure that the circuit breaker for your system is not tripped. Reset the circuit breaker if necessary. If the system won't restart after resetting the circuit breaker, contact the DEC and describe the problem you are having. Although it is recommended that your system operate continuously, the system can remain off for brief periods (power outage, vacations, etc).

CAN I REMODEL MY HOME AFTER A SYSTEM HAS BEEN INSTALLED?

Yes, you can remodel, but if you plan to change the foundation or add onto the building, you should notify the DEC. We will work with you to make any necessary modifications to the mitigation system.

HOW MUCH NOISE SHOULD THE EXHAUST FAN MAKE?

The fan motor should make about as much noise as a refrigerator fan. Because the fan motor is located outside of the house, many people will not notice it is operating unless they stand nearby. If you notice a loud noise coming from your fan, call the DEC.

WILL THE STATE REIMBURSE ME FOR THE COST TO OPERATE MY MITIGATION SYSTEM?

The DEC does not reimburse homeowners for electricity costs.

WILL THE STATE INSPECT AND MAINTAIN MY MITIGATION SYSTEM?

The DEC is responsible for maintaining your mitigation system so that it continues to function properly, but we rely on you to let us know if the system stops working as expected. Periodically, you should check to make sure the levels in the U-tube manometer are unequal. You should also confirm that the fan is running by listening for the hum of the motor or feeling the exhaust pipe for vibrations.

If the system needs repairs, such as fixing a section of pipe or replacing the fan, access to the fan or to system components located inside your home or business may be required. The DEC will arrange to have the work done at a time that is convenient to you.

Appendix H

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN

FOR SITE MANAGEMENT ACTIVITIES

FORMER DUSO CHEMICAL SITE AND

ADJACENT MID-HUDSON BUSINESS PARK

POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

NYSDEC Site Number: 314103

Prepared for:

New York State Department of Environmental Conservation

Division of Environmental Remediation

625 Broadway

Albany, NY 12233

Prepared by:

AECOM

40 British American Boulevard, Latham, New York 12110

(518) 951-2200

Table of Contents

Tables

1. INTRODUCTION

The purpose of this Quality Assurance Project Plan (QAPP) is to document and establish criteria for conducting monitoring and sampling events at a predetermined quality for the work conducted in association with the Site Management Plan (SMP) for the Former Duso Chemical Site and adjacent Mid-Hudson Business Park (MHBP) in Poughkeepsie, Dutchess County, New York (hereinafter referred to as the “site”).

2. FIELD SAMPLING

2.1 FIELD SAMPLING PROCEDURES

Field activities include groundwater sampling. It is worth noting here that for Per- and Polyfluoroalkyl Substances (PFAS) sampling, a close review of all sampling materials and a strict adherence to the AECOM and New York State Department of Environmental Conservation (NYSDEC) PFAS Sampling Guidance is required to avoid false positive results due to cross-contamination of samples. PFAS are found in a large number of materials commonly used in field work (including Teflon tubing, Tyvek, aluminum foil, markers, field notebooks, etc.).

Additionally, in the event that issues are discovered with the SSDS in the Star Gas Office Building or a regulatory agency requires sampling, the collection of indoor air, outdoor air, and sub-slab vapor samples may be required. These activities are discussed in detail in Section 4 (Monitoring and Sampling Plan) of the SMP, and Standard Operating Procedures (SOPs) are provided in **Appendix H** (Field Procedures).

2.2 EQUIPMENT DECONTAMINATION

To avoid cross-contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated according to the procedures discussed below.

Cross-contamination will be minimized by the use of vendor-decontaminated, dedicated, disposable equipment to the extent feasible. Personnel decontamination is discussed in the site-specific Health and Safety Plan (HASP) (SMP **Appendix I**), and a SOP for equipment decontamination is provided in **Appendix H**.

Small equipment decontamination for non-disposable equipment such as water level meters and submersible pumps will be accomplished using the following procedures:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse; and,
- Distilled/deionized water rinse, air dry.

Solvents will not be used in the field decontamination of such equipment. Decontamination will include scrubbing/washing with a laboratory grade detergent (e.g., Alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses. Tap water may be used from any treated municipal water system. The use of an untreated potable water supply is not an acceptable substitute.

Equipment should be allowed to dry prior to use. Steam cleaning or high pressure hot water cleaning may be used in the initial removal of gross, visible contamination.

Electric submersible pumps (such as a Grundfos Redi-Flow II) will be decontaminated using the above steps followed by running a large volume (several gallons) of potable water through the pump, followed by an analyte-free water rinse. Tubing will not be re-used (i.e., new tubing will be used for each well). Submersible pumps and supporting lines and cables will be placed in a plastic bucket filled with Liquinox and potable water and run for several minutes to decontaminate both exterior and interior parts. The process will be repeated with potable water. Submersible pumps will also be given a final analyte-free water rinse of both interior and exterior parts.

If bladder pumps are used, the pump will be disassembled and cleaned after each use. A new bladder will be used for each sample. Small parts, such as screens and gaskets will be replaced after each use. Dedicated airline tubing and Teflon sample tubing will be used at each monitoring well. The pump will be cleaned using the following steps:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse; and,
- Distilled/deionized water rinse, air dry.

3. SAMPLE HANDLING

3.1 SAMPLE IDENTIFICATION AND LABELING

Collected samples will be assigned a unique identification using the sample location or other sample-specific identifier.

For groundwater samples, the sample identification will adhere to the following example format:

MHBP-11-041318 (Well identification-MMDDYY)

For air/vapor samples, the sample identification will adhere to the following example format:

SGIA-1-041318 (Star Gas Indoor Air Location-MMDDYY)

Affixed to each sampling container will be a non-removable label on which the following information will be recorded with permanent water-proof ink:

Client	Sample Identification
Project Name	Requested Analysis
Preservative	Collected By
Collection Date / Time	

3.2 SAMPLE BOTTLES, PRESERVATION, AND HOLDING TIME

Table 1 identifies the sample analytical method, matrix, holding time, containers, and preservatives for the analyses to be performed at this site. Additional details are provided in the following subsections.

3.2.1 Sample Containers

The selection of sample containers used to collect samples is based on the criteria of the sample matrix, analytical method, potential contaminants of concern, reactivity of container material with the sample, quality assurance/quality control (QA/QC) requirements, and any regulatory protocol requirements. Sample bottles will be provided by the analytical laboratory and will conform to the requirements of the United States Environmental Protection Agency (US EPA) Specifications and Guidance for Contaminant-Free Sample Containers.

Aqueous samples for volatile organic compound (VOC) analysis will be collected in 40-mL vials with Teflon septa. Aqueous samples for semivolatiles and 1,4-dioxane will be collected in separate 1-liter glass bottles. Aqueous samples for metals will be collected in 250-mL plastic bottles, with dissolved metals samples filtered in the field. Aqueous samples for PFAS will be collected in 250-mL polypropylene bottles.

3.2.2 Sample Preservation

Samples will be preserved as indicated below and summarized in **Table 1**.

Aqueous Samples:

> Volatile organics - cooled to 4º C; HCl added to pH ≤ 2.
> Metals - cooled to 4º C; HNO3 added to pH ≤ 2.
> PFAS - cooled to 4º C; Trizma added.
> Other organic fractions (semivolatiles, pesticides, 1,4-dioxane, PCBs) – no chemical preservation.

Chemical preservatives will be added to the sample bottles (prior to sample collection) by the analytical laboratory. Sample preservation is checked upon sample receipt by the laboratory.

3.2.3 Holding Times

Holding times (see **Table 1**) are calculated from the time of sample collection; samples will be shipped from the field to arrive at the lab no later than 48 hours from the time of sample collection. Due to shipping regulations, more time may be required for shipping of the SUMMA canisters.

Although trip blanks are prepared in the analytical laboratory and shipped to the site prior to the collection of environmental samples, for the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered. Procurement of bottles and blanks will be scheduled to prevent trip blanks from being stored for excessive periods prior to their return to the laboratory, with the goal being that trip blanks should be held for no longer than one week prior to use.

3.3 CHAIN OF CUSTODY AND SHIPPING

A chain-of-custody (COC) form, typically provided by the analytical laboratory, will trace the path of sample containers from the project site to the laboratory.

Prior to a sampling event, AECOM personnel will notify the laboratory of upcoming field sampling and the subsequent transfer of samples. This notification will include information concerning the number and type of samples and the anticipated date of arrival. Insulated sample shipping containers (typically coolers) will be provided by the laboratory for shipping samples. Sample bottles within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory. Project personnel receiving the sample containers from the laboratory will check each cooler for the condition and integrity of the bottles prior to field work.

Once the sample containers are filled, they will be immediately placed in the cooler with ice (in Ziploc plastic bags to prevent leaking) or synthetic ice packs to maintain the samples at 4^{o}C. Additional details on the requirements for sample packaging and shipping are provided in Section 4 of the SMP (Monitoring and Sampling Plan).

4. DATA QUALITY REQUIREMENTS

4.1 ANALYTICAL METHODS

Groundwater sample analyses for this project will typically utilize the following analytical methods:

- VOCs (US EPA SW-846 8260C);
- Total organic carbon (TOC) (US EPA SM 5310B);

- Chloride (US EPA SM 4500Cl);
- Sulfate (US EPA Method 300);
- Sulfide (US EPA Method SM4500S-F);
- Dissolved gases (methane, ethane, and ethene; Method RSK 175);
- PFAS (SW-846 Method 537.1);
- 1,4-Dioxane (SW-846 Method 8270D SIM);
- Dehalobacter (DHB);
- Dehalococcoides (DHC); and
- Vinyl Chloride Reductase (VCR).

In addition to the groundwater data collected using these methods, the following field parameters will be measured during sample collection:

- pH;
- Oxidation/reduction potential (ORP);
- Dissolved oxygen (DO);
- Specific conductivity; and
- Temperature.

Air/vapor samples collected for this project will be analyzed using Method TO-15 Selected Ion Monitoring (SIM) for select low-level VOCs.

It is the laboratory's responsibility to be familiar with the requirements of the laboratory procedures and deliverables within it pertaining to New York State work. Category B deliverables will be required unless specified otherwise in specific work assignments or work plans.

The selected analytical laboratory must be approved by the NYSDEC and certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP).

4.2 QUALITY ASSURANCE OBJECTIVES

Data quality objectives (DQOs) for measurement data in terms of sensitivity and the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness) are established so that the data collected are sufficient and of adequate quality for their intended uses. Data collected and analyzed in conformance with the DQO process described in this QAPP will be used in assessing the uncertainty associated with decisions related to this site.

4.2.1 Sensitivity

The sensitivity or detection limit desired for each analysis or compound is based on the DQOs established for the project. The method detection limit (MDL) is determined in accordance with the procedure in ASP Exhibit A, Section 4.9.2.12, which is consistent with the procedure in 40 CFR Part 136 Appendix B.

The Reporting Limit (RL) for non-detected analytes will be the lowest calibration standard associated with the analysis. Reporting limits will be equal to or lower than those presented in Exhibit C of ASP 2005 for the applicable method. Analytes detected at concentrations below the RL but above the MDL will be flagged "J" (estimated) by the laboratory. Typical RLs are summarized in **Table 2**.

The RLs and MDLs of the assigned laboratory will be reviewed by AECOM personnel to verify that the laboratory sensitivity is sufficient to meet the project objectives. These will typically include meeting the applicable standards, criteria, and guidance (SCGs) including groundwater criteria (compiled in NYSDEC Technical & Operational Guidance Series (TOGS) 1.1.1) and air guidelines provided in the *Guidance for*

Evaluating Soil Vapor Intrusion in the State of New York (October 2006; updated September 2013, August 2015 and May 2017).

4.2.2 Precision

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates.

Relative Percent Difference (RPD) criteria determined from laboratory performance data are used to evaluate precision between duplicates. A matrix spike duplicate will be performed once for every 20 samples for VOCs and monitored natural attenuation (MNA) parameters in groundwater samples.

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation, relative standard deviation, range (maximum value minus minimum value), and relative range are common and may be used pending review of the data.

The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is easier to control and quantify than sampling precision. There are more historical data related to individual method performance and the "universe" is not limited to the samples received in the laboratory. In contrast, sampling precision is unique to each site or project.

Overall system (sampling plus analytical) precision will be determined by analysis of field duplicate samples. Analytical results from laboratory duplicate samples will provide data on measurement (analytical) precision.

Precision will be determined from field duplicates, as well as matrix spikes and matrix spike duplicates, and will be expressed as the RPD:

$$RPD = 100 \times 2(|X_1 - X_2|) / (X_1 + X_2)$$

where:

X_1 and X_2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Criteria for evaluation of laboratory duplicates are specified in the applicable methods. The objective for field duplicate precision is ≤ 50% RPD for all matrices for analytes detected at concentrations at least 2 times the RL. Where one or both analytes are detected at less than 2 times the RL, the criterion is the absolute difference “D” ($X_1 - X_2$), and D should be less than the RL for the analyte.

4.2.3 Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent method recovery criteria and those determined from laboratory performance data are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike or laboratory control will be performed once for every analytical batch or as specified in the method or ASP. Other method-specific laboratory QC samples (such as continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

$$\% \text{ Recovery} = 100 \times (SSR-SR)/SA$$

Where:

SSR = spiked sample result
SR = sample result, and
SA = spike added

Accuracy measures the bias in a measurement system. It is difficult to measure accuracy for the entire data collection activity; therefore, it will be assessed through use of known QC samples and presented as percent recovery.

Routine organic analytical protocol requires a surrogate spike in each sample. Surrogate recovery will be defined as:

$$\% \text{ Recovery} = (R/S) \times 100$$

Where:

S = surrogate spike concentration
R = reported surrogate compound concentration

Recovery criteria for laboratory spikes and other laboratory QC samples through which accuracy may be evaluated are established in the applicable analytical method.

4.2.4 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions. Representativeness will be determined by a comparison of the quality controls for these samples against data from similar samples analyzed at the same time.

4.2.5 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), the US EPA, or the NYSDOH/NYSDEC;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

Comparability within any specific project is also assessed by comparison of the project data to data generated previously and, if available, comparison of the data for multiple sampling events conducted for the project. Comparability (consistency) of sampling techniques is also assessed, to some extent, by analysis of field duplicates; although it should be noted that large differences between field duplicates may result from a wide variety of causes, not only inconsistent sampling.

4.2.6 Completeness

The goal of completeness is to generate the maximum amount possible of valid data for all planned samples. Completeness of 100 percent indicates that all planned samples were collected and the resulting data were fully valid and acceptable. As completeness is a function of both field activities and laboratory activities, separate completeness goals are established for each.

The default goal for sampling completeness is 95 percent, and is calculated as:

$$\text{Sampling Completeness (\%)} = (S_c/S_p) \times 100$$

Where:

S_c = Samples collected (submitted) for analysis (documented from field records or COC)
S_p = Samples planned (as documented in the project-specific work plans)

The default goal for analytical completeness is also set at 95 percent. Analytical completeness may be less than 100 percent either due to systemic failures that result in the rejection or loss of data for an entire sample or compound-specific rejection (e.g., 2-hexanone) within an otherwise valid analysis.

For typical work assignments, the default overall completeness goal is 90 percent useable data. The impact of rejected or unusable data will be made on a case-by-case basis. If the goals of the project can be achieved without the missing datum or data or if data from a different sampling event can be used to fill the data gap, no further action would be necessary. However, loss of critical data may require resampling or reanalysis.

4.3 Field Quality Assurance

Table 2 below shows typical QA/QC samples and reporting limits. Field QA/QC samples are discussed in the subsections below.

4.3.1 Blind Field Duplicate Samples

Blind field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method. Field duplicate samples are second samples collected from the same location, at the same time, in the same manner as the first, and placed into a separate container under a fictitious sample identification that is recorded only on the field notes. Each blind duplicate sample will be analyzed for the same parameters as the original sample collected that day.

The default field duplicate precision (RPD) objective is ≤50% percent RPD for all matrices where the sample concentration is at least two times the reporting limit. Where the analyte is detected in both samples but the concentration is less than 2 times the reporting limit, precision is assessed by the absolute difference, which should be less than the reporting limit. The RPD is not calculable when the analyte is not detected in one or both analyses. A more detailed discussion of the calculation is provided in **Section 4.2.2** (Precision), above.

Blind field duplicates will be collected at a frequency of one per 20 samples.

4.3.2 Trip Blanks

The purpose of a VOC trip blank (using demonstrated analyte-free water) is to place a mechanism of control on sample bottle preparation and blank water quality, and sample handling. The trip blank travels from the lab to the site with the empty sample bottles and back from the site with the collected samples. There will be a minimum of one trip blank per shipment containing aqueous samples for VOC analysis.

Trip blanks will be collected only when aqueous VOCs are being sampled and shipped. A trip blank is not required when the only aqueous samples in a shipment are QC samples.

4.3.3 Temperature Blanks

The laboratory will use either an infrared instrument to measure the temperature of liquid samples, or a temperature blank will be used to measure the temperature of liquid samples. If used, temperature blanks will be supplied by the analytical laboratory. If multiple coolers are necessary to store and transport aqueous samples, each cooler will contain an individual temperature blank (if used).

4.4 FIELD TESTING QC

Field testing of groundwater will be performed during purging of wells prior to sampling for laboratory samples. Field QC checks of control limits for pH, specific conductance (conductivity) and turbidity are detailed below. The calibration frequencies discussed below are the minimum. Field personnel can and should check calibration more frequently in adverse conditions, if anomalous readings are obtained, or subjective observations of instrument performance suggest the possibility of erroneous readings.

4.4.1 pH Meter

The pH meter is calibrated daily, using two standards bracketing the range of interest (generally 4.0 and 7.0). If the pH QC control sample (a pH buffer, which may be the same or different than those used to initially calibrate the instrument) exceeds 0.1 pH units from the true value, the source of the error will be determined and the instrument recalibrated. If a continuing calibration check with pH 7.0 buffer is off by more than 0.1 pH units, the instrument will be recalibrated. Expired buffer solutions will not be used.

Note that gel-type probes take longer to equilibrate (up to 15 minutes at near-freezing temperatures); this must be taken into account in calibrating the instrument and reading samples and standards.

4.4.2 Specific Conductivity

A vendor-provided conductivity standard will be used to check the calibration of the conductivity meter daily. Specific conductance QC samples will be on the order of 0.01 or 0.1 molar potassium chloride (KCl) solutions in accordance with manufacturer's recommendations.

4.4.3 Turbidity

The turbidity meter should be calibrated and checked daily using a standard as close as possible to 50 NTU (the critical value for determining effectiveness of well development and evacuation). The turbidity QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar).

4.4.4 Temperature

Temperature probes associated with instruments (such as the YSI SCT-33 conductivity and temperature meter) are not subject to field calibration, but the calibration should be checked to monitor instrument performance. It is recommended that the instrument temperature reading be checked against a NIST-traceable thermometer concurrently with checking the conductivity calibration. The instrument manual will be referenced for corrective actions if accurate readings cannot be obtained.

4.5 LABORATORY QUALITY ASSURANCE

4.5.1 Method Blanks

A method blank is laboratory water on which every step of the method is performed and analyzed along with the samples. Method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instruments as the sample is prepared and analyzed in the laboratory. Method blanks will be analyzed at a frequency of one for every 20 samples analyzed or as otherwise specified in the analytical protocol.

4.5.2 Spiked Samples

Two types of spiked samples will be prepared and analyzed as quality controls: matrix spikes and matrix spike duplicates (MS/MSD), which are analyzed to evaluate instrument and method performance and performance on samples of similar matrix. Additional groundwater volume will be provided to the laboratory by the project sampling team at a frequency of one for every 20 samples to allow for the MS/MSD analysis. In addition, matrix spike blanks (MSBs) will also be prepared and analyzed by the laboratory as required.

4.5.3 Laboratory Control Sample

A fortified clean matrix (laboratory control sample or LCS) is analyzed with each analysis. In some cases a “Laboratory-Fortified Blank” (LFB) may serve as the LCS. These samples generally consist of a standard aqueous or solid matrix fortified with the analytes of interest for single-analyte methods and selected analytes for multi-analyte methods according to the appropriate analytical method. The LCS may be analyzed in duplicate for some methods (LCSD). The analyte recovery from each analysis (LCS and LCSD) is used to monitor analytical accuracy; analytical precision can be assessed from evaluation of the LCS/LCSD in the same manner as the MS/MSD.

5. EQUIPMENT CALIBRATION AND MAINTENANCE PROCEDURES

Quality assurance for instrumentation and equipment used for a project is controlled by a formal calibration program, which verifies that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. Instruments and equipment that measure a quantity or with performance expected at a stated level are subject to calibration. Calibration is performed using reference standards or externally by calibration agencies or equipment manufacturers.

5.1 STANDARD WATER QUALITY FIELD EQUIPMENT

Field equipment used during the collection of environmental samples typically includes a turbidimeter (turbidity per US EPA Method 180.1), pH meter (pH per US EPA Method 150.1), conductivity meter (specific conductance per US EPA Method 120.1), thermometer, and photoionization detector. See also **Section 4.4** of this QAPP for additional discussion.

All field equipment used during the collection of groundwater samples will be calibrated following the manufacturer’s instructions at the beginning of the day, whenever the instrument is shut off for more than two hours, and at the field technician’s discretion.

5.2 LABORATORY EQUIPMENT CALIBRATION

Laboratory equipment will be calibrated according to the method-specific requirements of the 2005 NYSDEC ASP, Exhibit E, Parts II and III and maintained following professional judgment and the manufacturer’s specifications and additional requirements as specified in the ELAP certification manual.

5.2.1 Calibration Procedure

Written procedures are used for all instruments and equipment subject to calibration. For chemical analyses typically performed for this project, the calibration procedures are specified in the methods as compiled in the ASP. If established procedures are not available, a procedure is developed considering the type of equipment, stability characteristics of the equipment, required accuracy, and the effect of operational error on the quantities measured.

5.2.2 Calibration Frequency

Calibration frequency is based on the type of equipment, inherent stability, manufacturer's recommendations, values provided in recognized standards, intended data use, specified analytical methods, effect of error upon the measurement process, and prior experience.

5.2.3 Calibration Reference Standards

Two types of reference standards will be used by the laboratory for calibration, including:

- Physical standards, such as weights for calibrating balances and certified thermometers for calibrating working thermometers, refrigerators and ovens, are generally used for periodic calibration; and
- Chemical standards, such as Standard Reference Materials (SRMs) provided by the NIST or US EPA, may also include vendor-certified materials traceable to NIST or US EPA SRMs. These are primarily used for operational calibration.

5.2.4 Calibration Failure

Equipment that cannot be calibrated or becomes inoperable is removed from service. Such equipment must be repaired and satisfactorily recalibrated before re-use. For laboratory equipment that fails calibration, analysis cannot proceed until appropriate corrective action is taken and the analyst achieves an acceptable calibration.

Laboratory managers are responsible for development and implementation of a contingency plan for major equipment failure. The plan includes guidelines on waiting for repairs, use of other instrumentation, subcontracting analyses, and evaluating scheduled priorities.

5.2.5 Calibration Records

Records are prepared and maintained for each piece of equipment subject to calibration. Records demonstrating accuracy of preparation, stability, and proof of continuity of reference standards are also maintained. Copies of the raw calibration data are kept with the analytical sample data.

5.3 Operational Calibration

Operational calibration is generally performed as part of the analytical procedure and refers to those operations in which instrument response (in its broadest interpretation) is related to analyte concentration. Included are the preparation of a standard response (calibration) curve and often the analysis of blanks.

Preparation of a standard calibration curve is accomplished by the analysis of calibration standards, which are prepared by adding the analyte(s) of interest to the solvent that is introduced into the instrument. The concentrations of the calibration standards are chosen to cover the working range of the instrument or method. For most methods, five calibration standards are used, with the concentration of the lowest calibration standard being the reporting or quantitation limit for that analysis. Sample measurements are made and reported within this working range; apparent concentrations which exceed the high end of the calibrated range ("E"-flagged data for organic analyses) are diluted (or a smaller sample is used) and re-analyzed. The calibration curve is prepared by plotting or performing a linear regression of the instrument responses against the analyte concentration.

6. DATA REDUCTION, VALIDATION AND REPORTING

6.1 LABORATORY DATA REPORTING AND REDUCTION

Data reduction is the process by which raw analytical data generated from laboratory instrument systems is converted into usable concentrations. The raw data, which may take the form of area counts, instrument responses, or observations, are processed by the laboratory and converted into concentrations expressed in the parts per million (mg/kg or mg/L) or parts per billion (µg/kg or µg/L) range. Raw data from these systems include compound identifications, concentrations, retention times, and data system print-outs. Raw data are usually reported in graphic form, bar graph form, or tabular form. The laboratory will follow standard operating procedures consistent with the data handling requirements of the applicable methods.

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the 2005 revision of the NYSDEC ASP. ASP Deliverables are either Category B (full deliverables; similar to US EPA CLP requirements) or Category A (a reduced deliverable level). For this project, Category B deliverables are the default and will be provided for all deliverables generated for the project unless explicitly indicated otherwise on a site-specific basis.

To meet NYSDEC electronic data deliverable (EDD) requirements, the contracted laboratory for this work will be required to submit electronic deliverables in an EQuIS 4-file format. AECOM personnel will be responsible for submitting a final EQuIS deliverable to NYSDEC that meets NYSDEC EDD requirements.

6.2 DATA VALIDATION

If data validation is required, data generated for this site will be validated by a third-party subcontractor. The validator will follow guidelines established in the US EPA Region 2 SOPs applicable to the analytical method(s) being reviewed. These SOPs are checklists which are designed to formally and rigorously assess the quality and completeness of SW-846 analysis data packages. The use of these US EPA SOPs will be adapted to conform to the specific requirements of the NYSDEC ASP (e.g., NYSDEC/ASP holding times; matrix spike blank requirements). Where necessary and appropriate, supplemental validation criteria may be derived from the US EPA Functional Guidelines (US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540-R-10-011, January 2010, and the National Functional Guidelines for Organic Data Review, EPA-540-R-08-01, June 2008).

Data Usability Summary Reports (DUSRs), if data validation is determined to be required, will consist of text results of the review. Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be documented in the report text. Where QC failures caused the laboratory to perform a re-analysis, the data validator will make a recommendation as to which of the two analyses should be used. Data review will also include an assessment of sensitivity (i.e., are reporting limits appropriate to determine if contaminants are present at or above action levels or other applicable threshold values).

There may be some analyses for which there is no established US EPA or NYSDEC data validation protocol. In such cases, validation will be based on the Region 2 SOPs and US EPA Functional Guidelines as much as possible, as well as the laboratory's adherence to the technical requirements of the method, and the professional judgment of the validator. The degree of rigor in such validation will correspond to the nature of the data and the significance of the data and its intended use.

7. CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, corrective actions will be taken. These actions may include recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work.

Situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, the individual responsible for initiating the corrective action and also the individual responsible for approving the corrective action, if necessary, will be identified.

As part of its quality management system (QMS) program, AECOM provides relevant excerpts and conclusions from data validation reports to the analytical laboratories. The laboratories are therefore made aware of non-critical items and areas where improvement may be made in subsequent project-related work.

The objectives of the corrective action procedures presented below are to ensure that recognized errors in performance of sample and data acquisition lead to effective remedial measures and that those steps are documented to provide assurance that any data quality deficiencies are recognized in later interpretation and are not recurrent.

7.1 RATIONALE

Many times corrective actions are undertaken in a timely and effective fashion but go undocumented. In other cases, corrective actions are of a complex nature and may require scheduled interactions between departmental groups. In either case, documentation in a formal or informal sense can reinforce the effectiveness and duration of the corrective actions taken.

7.2 CORRECTIVE ACTION METHODS

7.2.1 Immediate Corrective Actions

Immediate corrective actions are of a minor or routine nature such as correcting malfunctioning equipment, correction of data transcription errors, and other such activities routinely made in the field, laboratory, or office by technicians, analysts, and other project staff.

7.2.2 Long-Term Corrective Actions

Long-term corrective action will be used to identify and eliminate causes of non-conformances which are of a complex nature and that are formally reported between management groups.

7.2.3 Corrective Action Steps

For long-term corrective actions, steps comprising a closed-loop corrective action system are as follows:

- Define the problem;
- Assign responsibility for investigating the problem;
- Investigate and determine the cause of the problem;
- Determine a corrective action to eliminate the problem;
- Assign and accept responsibility for implementing the corrective action; and
- Verify that the corrective action has eliminated the problem.

Non-conformance events associated with analytical work are documented by the laboratories' Non-Conformance Records, which are reviewed and approved by the laboratory's Quality Assurance Manager.

7.3 CORRECTIVE ACTION REPORT REVIEW AND FILING

Immediate and long-term corrective actions require review to assure that during the time of non-conformance, erroneous data were not generated or that, if possible, correct data were acquired instead. Such confirmation and review is the responsibility of the supervisor of the staff implementing the corrective action. Confirmation will be acknowledged by notation and dated signature on the affected data record or appropriate form or by memorandum to AECOM project management.

8. REFERENCES

NYSDEC, 2010a. *Technical Guidance for Site Investigation and Remediation. Draft. DER-10*. Division of Environmental Remediation. December.

New York State Department of Environmental Conservation (NYSDEC), 2005. *Analytical Services Protocol (ASP) Manual*. July.

NYSDOH ELAP Web site. http://www.wadsworth.orglabcert/elap

NYSDOH. 2006. Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October.

US EPA Region 2, Standard Operating Procedures for Data Review. Available at http://www.epa.gov/region02/qa/documents.htm#sop.

US EPA, 1986. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third edition. EPA SW-846. With revisions and updates through March, 2009. Accessed on line (at "SW-846 On-Line") at http://www.epa.gov/epaoswer/hazwaste/test/main.htm

US EPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. US EPA Office of Emergency and Remedial Response. OSWER Directive No. 355.3-01. October.

US EPA, 2010. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540/R-10-011. January.

US EPA, 2008. Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA/540/R-08-01. June.

Table 1
Quality Assurance Project Plan
Former Duso Chemical Site and Adjacent Mid-Hudson Business Park

Sample Bottle, Volume, Preservation, and Holding Time Summary

Analysis	Analytical Method (1)	Typical Sample Bottles				Preservation(2)	Holding Time (2, 3)	Comment
		Mat'l	Size	Qty	Source			
Aqueous Samples								
VOCs	SW-846 8260C	G	40 mL	2 or 3	Lab	HCl	14 days	7 days if not preserved.
TOC	EPA SM 5310B	G	250 mL	1	Lab	H_2SO_4	28 days	
Chloride	EPA SM 4500Cl	P	125 mL	1	Lab	None	28 days	
Sulfate	EPA Method 300	P	125 mL	1	Lab	None	28 days	
Sulfide	EPA SM4500S-F	P	500 mL	1	Lab	$ZnAc_2$ & NaOH	7 days	
Dissolved gases (methane, ethane, and ethene)	Method RSK 175	G	40 mL	2	Lab	HCl	14 days	
PFAS	SW-846 537.1	polypropylene	250 mL	1	Lab	Trizma	14 days	28 days post-extraction.
1,4-Dioxane	SW-846 8270D SIM	G	1 L	2	Lab	None	7 days	
Dehalobacter, Dehalococcoides, and Vinyl Chloride Reductase	DNA (qPCR)	polyethylene or G	1 - 2 L	1	Lab	None	24 - 48 hours	
Air/Vapor Samples								
Volatile Organics - Low Level	EPA TO-15 SIM	SS	6 L	1	Lab	None	14 days	SUMMA canister; certified clean by laboratory.

(1) More recent versions of SW-846 methods may be used subject to AECOM approval.
(2) All samples for chemical analysis should be held at 4 degrees C in addition to any chemical preservation required.
(3) Holding time calculated from day of collection, unless noted as being from time of extraction. Laboratory holding times (ASP 2005, Exhibit I) are two days shorter to allow for field handling and shipping.
G = Glass
P = Plastic
SS = Stainless Steel
SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. USEPA SW-846. Complete through Update IV, March 2009.
EPA TO-15 SIM = Compendium of Methods for the Determination of Toxic Organics in Air, Second Edition (EPA/625/R-96/010b; 1999)

Table 2
Quality Assurance Project Plan
Former Duso Chemical Site and Adjacent Mid-Hudson Business Park

Typical Reporting Limits and QA/QC Sample Quantity Summary

Analysis	Analytical Method	Laboratory	Reporting Limit -Typical (units as specified)	Field Sample Quantity[1]	Matrix Spike (MS) or LCS[1]	MS Duplicate or Matrix Duplicate[1]	Field Duplicate[1]	Equipment or Field Blank [1,2]	Trip Blank[3]	Total Analyses per Event
Aqueous Samples										
VOCs	SW-846 8260C	Con-Test	0.5 - 1.0 µg/L (typical)	15	1	1	1	1	1	20
TOC	EPA SM 5310B	Con-Test	2 - 10 mg/L (typical)	15	1	1	1	1	NA	19
Chloride	EPA SM 4500Cl	Con-Test	0.1 - 2 mg/L (typical)	15	1	1	1	1	NA	19
Sulfate	EPA Method 300	Con-Test	0.2 - 2 mg/L (typical)	15	1	1	1	1	NA	19
Sulfide	EPA SM4500S-F	Con-Test	2.0 mg/L (typical)	15	1	1	1	1	NA	19
Dissolved gases (methane, ethane, and ethene)	Method RSK 175	Con-Test	0.1 - 1.5 µg/L (typical)	15	1	1	1	1	NA	19
PFAS	SW-846 537.1	TestAmerica	2 ng/L	6	1	1	1	2	NA	11
1,4-Dioxane	SW-846 8270D SIM	TestAmerica	0.1 µg/L	6	1	1	1	0	NA	9
Dehalobacter, Dehalococcoides, and Vinyl Chloride Reductase	DNA (qPCR)	Microbial Insights	Not Applicable	15	0	0	1	0	NA	16
Air Samples										
VOCs - Low Level	TO-15-SIM	Con-Test	0.2 $\mu g/m^3$ [(5)]	3	NA [4]	NA [4]	1	NA	NA	4

<u>Notes</u>
1 Field sample quantities shown are based on a typical monitoring event. QC quantity requirements are typically one for each group of 20 or fewer field samples.
2 Field equipment rinsate blank quantity will vary depending on sample collection rate and types of sampling equipment used; quantity may be greater or less than that shown.
3 One trip blank will be included for each shipping container containing VOCs.
4 Spikes, LCS, and duplicates are not explicitly required by method TO-15 but are usually included as part the laboratory's analytical QA program.
5 A reporting limit of 0.2 $\mu g/m^3$ is required for NYSDOH decision matrices for indoor air and outdoor (ambient) air samples.

Appendix I

Site Management Forms

Site-Wide Annual Inspection Form

Duso Site and MHBP Treatment Area,
Former Duso Chemical Site,
Poughkeepsie, New York

Engineering Control (s):__________________ Inspection Date:________________________

Item	Yes	No	N/A	Comments
Does the Engineering Control continue to perform as designed?				
Does the Engineering Control continue to protect human health and the environment?				
Does the Engineering Control comply with requirements established in the SMP?				
Has remedial performance criteria been achieved or maintained?				
Has sampling and analysis of appropriate media been performed during the monitoring event?				
Have there been any modifications made to the remedial or monitoring system?				
Does the remedial or monitoring system need to be changed or altered at this time?				
Has there been any intrusive activity, excavation, or construction occurred at the site?				
Were the activities mentioned above, performed in accordance with the SMP?				
Was there a change in the use of the site or were there new structures constructed on the site?				
In case a new occupied structure is constructed or the use of the current building changed, was a vapor intrusion evaluation done?				
Were new mitigation systems installed based on monitoring results?				
Were the groundwater wells in the monitoring network inspected during this site inspection? If so, were the Monitoring Well Field Inspection Logs Completed?				

Note: Upon completion of the form any non-conforming items warranting corrective action should be identified here within.

Name of Inspector: ______________________ Signature of Inspector: ______________________
Inspector's Company: ______________________ Date: ______________________

IMMEDIATELY REPORT ANY FAILURE OR DEFECT TO THE PROJECT MANAGER SO A COUNTERMEASURE PLAN CAN BE IMPLEMENTED.

SITE NAME: ______________________________ SITE ID.: ______
INSPECTOR: ______
DATE/TIME: ______
WEll ID.: ______

MONITORING WELL FIELD INSPECTION LOG

	YES	NO
WELL VISIBLE? (If not, provide directions below)		

WELL COORDINATES? NYTM X____________ NYTM Y__________________

PDOP Reading from Trimble Pathfinder:_______ Satelites:________

GPS Method (circle) Trimble And/Or Magellan

	YES	NO
WELL I.D. VISIBLE?		
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)		

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: ....

	YES	NO
SURFACE SEAL PRESENT?		
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)		
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)		

HEADSPACE READING (ppm) AND INSTRUMENT USED.. ______

TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable) ______

PROTECTIVE CASING MATERIAL TYPE: .... ______

MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): ....

	YES	NO
LOCK PRESENT?		
LOCK FUNCTIONAL?		
DID YOU REPLACE THE LOCK?		
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		
WELL MEASURING POINT VISIBLE?		

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): .... ______

MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): .... ______

MEASURE WELL DIAMETER (Inches): .... ______

WELL CASING MATERIAL: .... ______

PHYSICAL CONDITION OF VISIBLE WELL CASING: .... ______

ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE .... ______

PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES.. ______

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

REMARKS:

Sketch

Monitoring Well Purging/Sampling Form

Project Name and Number: ______________________________

Monitoring Well Number: ____________ Date: ____________

Samplers: ______________________________

Sample Number: ____________ QA/QC Collected? ____________

Purging / Sampling Method: ______________________________

1. L = Total Well Depth: ________ feet
2. D = Riser Diameter (I.D.): ________ feet
3. W = Static Depth to Water (TOC): ________ feet
4. C = Column of Water in Casing: ________ feet
5. V = Volume of Water in Well = $C(3.14159)(0.5D)^2(7.48)$ ________ gal
6. D2 = Pump Setting Depth (ft): ________ feet
7. C2 = Column of water in Pump/Tubing (ft): ________ feet
8. Tubing Volume = C2(0.005737088) ________ gal

D (inches)	D (feet)
1-inch	0.08
2-inch	0.17
3-inch	0.25
4-inch	0.33
6-inch	0.50

Conversion factors to determine V given C

D (inches)	1-inch	2-inch	3-inch	4-inch	6-inch
V (gal / ft)	0.041	0.163	0.37	0.65	1.5

Water Quality Readings Collected Using ______________________________

Parameter	**Units**	**Readings**						
Time	24 hr							
Water Level (0.33)	feet							
Volume Purged	gal							
Flow Rate	mL / min							
Turbidity (+/- 10%)	NTU							
Dissolved Oxygen (+/- 10%)	%							
Dissolved Oxygen (+/- 10%)	mg/L							
Eh / ORP (+/- 10)	MeV							
Specific Conductivity (+/- 3%)	mS/cm^c							
Conductivity (+/- 3%)	mS/cm							
pH (+/- 0.1)	pH unit							
Temp (+/- 0.5)	C							
Color	Visual							
Odor	Olfactory							

Comments:

* Three consecutive readings within range indicates stabilization of that parameter.

SVI System Evaluation
For Star Gas Building
Former Duso Chemical Site, Poughkeepsie, New
York

Date/Time: ____________________

Weather: ____________________

Building #: ____________________

System #	**On / Off**	**inches H_20**	**Piping Condition**	**Fan Condition**	**Notes**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Comments:____

Note: Upon completion of the form, any non-conforming items warranting corrective action should be identified here within.

Name of Inspector:_________________________ Signature of Inspector:_____________________

Inspector's Company:________________________ Date:__________________________________

VAPOR INTRUSION SURVEY

SUB-SLAB VAPOR SAMPLING LOG SHEET

Sampled by:

						Inches	PPB [1]	Inches of Mercury		
Sample ID	Sample Date	Canister Number	Regulator Number	Sample Start Time	Sample Stop Time	Sample Depth	PID Reading	Vacuum Before	Vacuum at Start	Vacuum After

Notes:

1 - Parts per billion (PPB) isobutylene equivalent

2 - Regulators were pre-set by laboratory to 0.0042 Liters/minute sampling rate

3 - All sub-slab (SS) samples were collected in 6-liter SUMMA ® canisters after purging the sample tubing of its contents

VAPOR INTRUSION SURVEY

INDOOR VAPOR SAMPLING LOG SHEET

Sampled by:

						PPB [1]	Inches of Mercury		
Sample ID	Sample Date	Canister Number	Regulator Number	Sample Start Time	Sample Stop Time	PID Reading	Vacuum Before	Vacuum at Start	Vacuum After

Notes:

1 - Parts per billion (PPB) isobutylene equivalent

2 - Regulators were pre-set by laboratory to 0.0042 Liters/minute sampling rate

3 - All Indoor Air (IA) samples were collected in 6-liter SUMMA ® canisters from a height of 4-6 feet above ground surface

4 - *Indicates Sample that has been duplicated

VAPOR INTRUSION SURVEY
OUTDOOR VAPOR SAMPLING LOG SHEET

Sampled by:

						PPB [1]	Inches of Mercury		
Sample ID	Sample Date	Canister Number	Regulator Number	Sample Start Time	Sample Stop Time	PID Reading	Vacuum Before	Vacuum at Start	Vacuum After

Notes:
1 - Parts per billion (PPB) isobutylene equivalent
2 - Regulators were pre-set by laboratory to 0.0042 Liters/minute sampling rate
3 - All Outdoor Air (OA) samples were collected in 6-liter SUMMA ® canisters from a height of 4-6 feet above ground surface

Appendix J

Field Procedures

1. Logbooks
2. Recordkeeping, Sample Labeling, and Chain-of-Custody
3. Sample Handling, Storage, and Shipping
4. Investigation Derived Waste Management
5. Equipment Decontamination
6. Monitoring Well Sampling
7. Operation and Calibration of a Photoionization Detector
8. Water Quality Parameter Testing for Groundwater Sampling
9. Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

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Logbooks

Procedure 3-02

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes the activities and responsibilities pertaining to the identification, use, and control of logbooks and associated field data records.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 In order to keep the logbook clean, store it in a clean location and use it only when outer gloves used for PPE have been removed.

3.0 Terms and Definitions

3.1 **Logbook**

A logbook is a bound field notebook with consecutively numbered, water-repellent pages that is clearly identified with the name of the relevant activity, the person assigned responsibility for maintenance of the logbook, and the beginning and ending dates of the entries.

3.2 **Data Form**

A data form is a predetermined format utilized for recording field data that may become, by reference, a part of the logbook (e.g., soil boring logs, trenching logs, surface soil sampling logs, groundwater sample logs, and well construction logs are data forms).

4.0 Training and Qualifications

4.1 The **Project Manager** or **designee** is responsible for determining which team members shall record information in field logbooks and for obtaining and maintaining control of the required logbooks. The **Project Manager** shall review the field logbook on at least a monthly basis. The **Project Manager** or **designee** is responsible for reviewing logbook entries to determine compliance with this procedure and to ensure that the entries meet the project requirements.

4.2 A knowledgeable individual such as the **Field Manager**, **Project Manager**, or **Program Quality Manager** shall perform a technical review of each logbook at a frequency commensurate with the level of activity (weekly is suggested, or, at a minimum, monthly). Document these reviews by the dated signature of the reviewer on the last page or page immediately following the material reviewed.

4.3 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.4 The **Field Manager** is responsible for ensuring that all **field personnel** follow these procedures and that the logbook is completed properly and daily. The **Field Manager** is also responsible for submitting copies to the **Project Manager**, who is responsible for filing them and submitting a copy (if required by the project's Statement of Work).

4.5 The **logbook user** is responsible for recording pertinent data into the logbook to satisfy project requirements and for attesting to the accuracy of the entries by dated signature. The **logbook user** is also responsible for safeguarding the logbook while having custody of it.

4.6 All **field personnel** are responsible for the implementation of this procedure.

5.0 Equipment and Supplies

5.1 Field logbooks shall be bound field notebooks with water-repellent pages.

5.2 Pens shall have indelible black ink.

6.0 Procedure

6.1 The field logbook serves as the primary record of field activities. Make entries chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct the applicable events. Store the logbook in a clean location and use it only when outer gloves used for personal protective equipment (PPE) have been removed.

6.2 Individual data forms may be generated to provide systematic data collection documentation. Entries on these forms shall meet the same requirements as entries in the logbook and shall be referenced in the applicable logbook entry. Individual data forms shall reference the applicable logbook and page number. At a minimum, include names of all samples collected in the logbook even if they are recorded elsewhere.

6.3 Enter field descriptions and observations into the logbook, as described in Attachment 1, using indelible black ink.

6.4 Typical information to be entered includes the following:

- Dates (month/day/year) and times (military) of all on-site activities and entries made in logbooks/forms;
- Site name and description;
- Site location by longitude and latitude, if known;
- Weather conditions, including temperature and relative humidity;
- Fieldwork documentation, including site entry and exit times;
- Descriptions of, and rationale for, approved deviations from the work plan (WP) or field sampling plan;
- Field instrumentation readings;
- Names, job functions, and organizational affiliations of on-site personnel;
- Photograph references;
- Site sketches and diagrams made on site;
- Identification and description of sample morphology, collection locations, and sample numbers;
- Sample collection information, including dates (month/day/year) and times (military) of sample collections, sample collection methods and devices, station location numbers, sample collection depths/heights, sample preservation information, sample pH (if applicable), analysis requested (analytical groups), etc., as well as chain-of-custody (COC) information such as sample identification numbers cross-referenced to COC sample numbers;

- Sample naming convention;
- Field quality control (QC) sample information;
- Site observations, field descriptions, equipment used, and field activities accomplished to reconstruct field operations;
- Meeting information;
- Important times and dates of telephone conversations, correspondence, or deliverables;
- Field calculations;
- PPE level;
- Calibration records;
- Contractor and subcontractor information (address, names of personnel, job functions, organizational affiliations, contract number, contract name, and work assignment number);
- Equipment decontamination procedures and effectiveness;
- Laboratories receiving samples and shipping information, such as carrier, shipment time, number of sample containers shipped, and analyses requested; and
- User signatures.

6.5 The logbook shall reference data maintained in other logs, forms, etc. Correct entry errors by drawing a single line through the incorrect entry, then initialing and dating this change. Enter an explanation for the correction if the correction is more than for a mistake.

6.6 At least at the end of each day, the person making the entry shall sign or initial each entry or group of entries.

6.7 Enter logbook page numbers on each page to facilitate identification of photocopies.

6.8 If a person's initials are used for identification, or if uncommon acronyms are used, identify these on a page at the beginning of the logbook.

6.9 At least weekly and preferably daily, the **preparer** shall photocopy and retain the pages completed during that session for backup. This will prevent loss of a large amount of information if the logbook is lost.

7.0 Quality Control and Assurance

7.1 Review per Section 4.2 shall be recorded.

8.0 Records, Data Analysis, Calculations

8.1 Retain the field logbook as a permanent project record. If a particular project requires submittal of photocopies of logbooks, perform this as required.

8.2 Deviations from this procedure shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

9.0 Attachments or References

9.1 Attachment 1 – Description of Logbook Entries

9.2 Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency

and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf.

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Attachment 1
Description of Logbook Entries

Logbook entries shall be consistent with Section A.1.4 *Field Documentation SOPs* of the UFP-QAPP Manual (DoD 2005) and contain the following information, as applicable, for each activity recorded. Some of these details may be entered on data forms, as described previously.

Name of Activity	**For example, Asbestos Bulk Sampling, Charcoal Canister Sampling, Aquifer Testing.**
Task Team Members and Equipment	Name all members on the field team involved in the specified activity. List equipment used by serial number or other unique identification, including calibration information.
Activity Location	Indicate location of sampling area as indicated in the field sampling plan.
Weather	Indicate general weather and precipitation conditions.
Level of PPE	Record the level of PPE (e.g., Level D).
Methods	Indicate method or procedure number employed for the activity.
Sample Numbers	Indicate the unique numbers associated with the physical samples. Identify QC samples.
Sample Type and Volume	Indicate the medium, container type, preservative, and the volume for each sample.
Time and Date	Record the time and date when the activity was performed (e.g., 0830/08/OCT/89). Use the 24-hour clock for recording the time and two digits for recording the day of the month and the year.
Analyses	Indicate the appropriate code for analyses to be performed on each sample, as specified in the WP.
Field Measurements	Indicate measurements and field instrument readings taken during the activity.
Chain of Custody and Distribution	Indicate chain-of-custody for each sample collected and indicate to whom the samples are transferred and the destination.
References	If appropriate, indicate references to other logs or forms, drawings, or photographs employed in the activity.
Narrative (including time and location)	Create a factual, chronological record of the team's activities throughout the day including the time and location of each activity. Include descriptions of general problems encountered and their resolution. Provide the names and affiliations of non-field team personnel who visit the site, request changes in activity, impact the work schedule, request information, or observe team activities. Record any visual or other observations relevant to the activity, the contamination source, or the sample itself. It should be emphasized that logbook entries are for recording data and chronologies of events. The logbook author must include observations and descriptive notations, taking care to be objective and recording no opinions or subjective comments unless appropriate.
Recorded by	Include the signature of the individual responsible for the entries contained in the logbook and referenced forms.
Checked by	Include the signature of the individual who performs the review of the completed entries.

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Recordkeeping, Sample Labeling, and Chain-of-Custody

Procedure 3-03

1.0 Purpose and Scope

1.1 The purpose of this standard operating procedure is to establish standard protocols for all field personnel for use in maintaining field and sampling activity records, writing sample logs, labeling samples, ensuring that proper sample custody procedures are utilized, and completing chain-of-custody/analytical request forms.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

Not applicable.

3.0 Terms and Definitions

3.1 **Logbook**

A logbook is a bound field notebook with consecutively numbered, water-repellent pages that is clearly identified with the name of the relevant activity, the person responsible for maintenance of the logbook, and the beginning and ending dates of the entries.

3.2 **Chain-of-Custody**

Chain-of-custody (COC) is documentation of the process of custody control. Custody control includes possession of a sample from the time of its collection in the field to its receipt by the analytical laboratory, and through analysis and storage prior to disposal.

4.0 Training and Qualifications

4.1 The **Project Manager** is responsible for determining which team members shall record information in the field logbook and for checking sample logbooks and COC forms to ensure compliance with these procedures. The **Project Manager** shall review COC forms on a monthly basis at a minimum.

4.2 The **Project Manager** and **Program Quality Manager** are responsible for evaluating project compliance with the Project Procedures Manual.

4.3 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.4 The **Laboratory Project Manager** or **Sample Control Department Manager** is responsible for reporting any sample documentation or COC problems to the **Project Manager** or **Project Laboratory Coordinator** within 24 hours of sample receipt.

4.5 The **Field Manager** is responsible for ensuring that all **field personnel** follow these procedures. The **Project Laboratory Coordinator** is responsible for verifying that the COC/analytical request forms have been completed properly and match the sampling and analysis plan. The **Project Manager** or **Project Laboratory Coordinator** is responsible for notifying the **laboratory**, **data managers**, and **data validators** in writing if analytical request changes are required as a corrective action. These small changes are different from change orders, which involve changes to the scope of the subcontract with the laboratory and must be made in accordance with a respective contract (e.g., CLEAN remedial action contract).

4.6 All **field personnel** are responsible for following these procedures while conducting sampling activities. **Field personnel** are responsible for recording pertinent data into the logbook to satisfy project requirements and for attesting to the accuracy of the entries by dated signature.

5.0 Procedure

This procedure provides standards for documenting field activities, labeling the samples, documenting sample custody, and completing COC/analytical request forms. The standards presented in this section shall be followed to ensure that samples collected are maintained for their intended purpose and that the conditions encountered during field activities are documented.

5.1 Recordkeeping

The field logbook serves as the primary record of field activities. Make entries chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct each day's events. Field logs such as soil boring logs and ground-water sampling logs will also be used. These procedures are described in Procedure 3-02, *Logbooks*.

5.2 Sample Labeling

Affix a sample label with adhesive backing to each individual sample container. Place clear tape over each label (preferably prior to sampling) to prevent the labels from tearing off, falling off, being smeared, and to prevent loss of information on the label. Record the following information with a waterproof marker on each label:

- Project name or number (optional);
- COC sample number;
- Date and time of collection;
- Sampler's initials;
- Matrix (optional);
- Sample preservatives (if applicable); and
- Analysis to be performed on sample (this shall be identified by the method number or name identified in the subcontract with the laboratory).

These labels may be obtained from the analytical laboratory or printed from a computer file onto adhesive labels.

5.3 Custody Procedures

For samples intended for chemical analysis, sample custody procedures shall be followed through collection, transfer, analysis, and disposal to ensure that the integrity of the samples is maintained. Maintain custody of samples in accordance with the U.S. Environmental Protection Agency (EPA) COC guidelines prescribed in EPA *NEIC Policies and Procedures*, National Enforcement Investigations Center, Denver, Colorado, revised May 1986; EPA *RCRA Ground Water Monitoring Technical Enforcement Guidance Document* (TEGD); *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA OSWER Directive 9355 3-01); Appendix 2 of the *Technical Guidance Manual for Solid Waste Water*

Quality Assessment Test (SWAT) Proposals and Reports; and *Test Methods for Evaluating Solid Waste* (EPA SW-846)

A description of sample custody procedures is provided below.

5.3.1 Sample Collection Custody Procedures

According to the U.S. EPA guidelines, a sample is considered to be in custody if one of the following conditions is met:

- It is in one's actual physical possession or view;
- It is in one's physical possession and has not been tampered with (i.e., it is under lock or official seal);
- It is retained in a secured area with restricted access; and
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

Place custody seals on sample containers immediately after sample collection and on shipping coolers if the cooler is to be removed from the sampler's custody. Place custody seals in such a manner that they must be broken to open the containers or coolers. Label the custody seals with the following information:

- Sampler's name or initials; and
- Date and time that the sample/cooler was sealed.

These seals are designed to enable detection of sample tampering. An example of a custody seal is shown in Attachment 1.

Field personnel shall also log individual samples onto COC forms (carbon copy or computer generated) when a sample is collected. These forms may also serve as the request for analyses. Procedures for completing these forms are discussed in Section 5.4, indicating sample identification number, matrix, date and time of collection, number of containers, analytical methods to be performed on the sample, and preservatives added (if any). The **samplers** will also sign the COC form signifying that they were the personnel who collected the samples. The COC form shall accompany the samples from the field to the laboratory. When a cooler is ready for shipment to the analytical laboratory, the **person delivering the samples for transport** will sign and indicate the date and time on the accompanying COC form. One copy of the COC form will be retained by the **sampler** and the remaining copies of the COC form shall be placed inside a self-sealing bag and taped to the inside of the cooler. Each cooler must be associated with a unique COC form. Whenever a transfer of custody takes place, **both parties** shall sign and date the accompanying carbon copy COC forms, and the **individual relinquishing the samples** shall retain a copy of each form. One exception is when the samples are shipped; the **delivery service personnel** will not sign or receive a copy because they do not open the coolers. The **laboratory** shall attach copies of the completed COC forms to the reports containing the results of the analytical tests. An example COC form is provided in Attachment 2.

5.3.2 Laboratory Custody Procedures

The following custody procedures are to be followed by an **independent laboratory** receiving samples for chemical analysis; the procedures in their Laboratory Quality Assurance Plan must follow these same procedures. A **designated sample custodian** shall take custody of all samples upon their arrival at the analytical laboratory. The **custodian** shall inspect all sample labels and COC forms to ensure that the information is consistent, and that each is properly completed. The **custodian** will also measure the temperature of the temperature blank in the coolers upon arrival using either a National Institute for Standards and Technology calibrated thermometer or an infra-red temperature gun. The **custodian** shall note the condition of the samples including:

- If the samples show signs of damage or tampering;
- If the containers are broken or leaking;
- If headspace is present in sample vials;
- If proper preservation of samples has occurred (made by pH measurement, except volatile organic compounds [VOCs] and purgeable total petroleum hydrocarbons [TPH] and temperature). The pH of VOC and purgeable TPH samples will be checked by the **laboratory analyst** after the sample aliquot has been removed from the vial for analysis; and
- If any sample holding times have been exceeded.

All of the above information shall be documented on a sample receipt sheet by the **custodian**.

Discrepancies or improper preservation shall be noted by the **laboratory** as an out-of-control event and shall be documented on an out-of-control form with corrective action taken. The out-of-control form shall be signed and dated by the **sample control custodian** and **any other persons** responsible for corrective action. An example of an out-of-control form is included as Attachment 4.

The **custodian** shall then assign a unique laboratory number to each sample and distribute the samples to secured storage areas maintained at 4 degrees Celsius (soil samples for VOC analysis are to be stored in a frozen state until analysis). The unique laboratory number for each sample, COC sample number, client name, date and time received, analysis due date, and storage shall also be manually logged onto a sample receipt record and later entered into the laboratory's computerized data management system. The **custodian** shall sign the shipping bill and maintain a copy.

Laboratory personnel shall be responsible for the care and custody of samples from the time of their receipt at the laboratory through their exhaustion or disposal. Samples should be logged in and out on internal laboratory COC forms each time they are removed from storage for extraction or analysis.

5.4 Completing COC/Analytical Request Forms

COC form/analytical request form completion procedures are crucial in properly transferring the custody and responsibility of samples from field personnel to the laboratory. This form is important for accurately and concisely requesting analyses for each sample; it is essentially a release order from the analysis subcontract.

Attachment 2 is an example of a generic COC/analytical request form that may be used by **field personnel**. Multiple copies may be tailored to each project so that much of the information described below need not be handwritten each time. Attachment 3 is an example of a completed site-specific COC/analytical request form, with box numbers identified and discussed in text below.

COC forms tailored and can be drafted and printed onto multi-ply forms. This eliminates the need to rewrite the analytical methods column headers each time. It also eliminates the need to write the project manager, name, and number; QC Level; TAT; and the same general comments each time.

Complete one COC form per cooler. Whenever possible, place all VOC analyte vials into one cooler in order to reduce the number of trip blanks. Complete all sections and be sure to sign and date the COC form. One copy of the COC form must remain with the field personnel.

Box 2 **Bill To:** List the name and address of the person/company to bill only if it is not in the subcontract with the laboratory.

Box 3 **Sample Disposal Instructions:** These instructions will be stated in the Master Service Agreement with each laboratory.

Shipment Method: State the method of shipment (e.g., hand carry or air courier via FedEx or DHL).

Comments: This area shall be used by the field team to communicate observations, potential hazards, or limitations that may have occurred in the field or additional information regarding analysis (e.g., a specific metals list, samples expected to contain high analyte concentrations).

Box 4 **Cooler No.:** This will be written on the inside or outside of the cooler and shall be included on the COC. Some laboratories attach this number to the trip blank identification, which helps track samples for VOC analysis. If a number is not on the cooler, field personnel shall assign a number, write it on the cooler, and write it on the COC.

QC Level: Enter the reporting quality control (QC) requirements (e.g., Full Data Package, Summary Data Package).

Turnaround time (TAT): TAT will be determined by a sample delivery group (SDG), which may be formed over a 14-day period, not to exceed 20 samples. Once the SDG has been completed, standard TAT is 21 calendar days from receipt of the last sample in the SDG. Entering NORMAL or STANDARD in this field will be acceptable. If quicker TAT is required, it shall be in the subcontract with the laboratory and reiterated on each COC to remind the laboratory.

Box 5 **Type of Containers:** Write the type of container used (e.g., 1-liter glass amber, for a given parameter in that column).

Preservatives: Field personnel must indicate on the COC the correct preservative used for the analysis requested. Indicate the pH of the sample (if tested) in case there are buffering conditions found in the sample matrix.

Box 6 **Sample Identification (ID) Number:** This is typically a five-character alphanumeric identifier used by the contractor to identify samples. The use of this identifier is important since the laboratories are restricted to the number of characters they are able to use. Sample numbering shall be in accordance with the project-specific sampling and analysis plan.

Description (Sample ID): This name will be determined by the location and description of the sample, as described in the project-specific sampling and analysis plan. This sample identification should not be submitted to the laboratory, but should be left blank. If a computer COC version is used, the sample identification can be input, but printed with this block black. A cross-referenced list of the COC Sample Number and sample identification must be maintained separately.

Date Collected: Record the collection date in order to track the holding time of the sample. Note: For trip blanks, record the date it was placed in company with samples.

Time Collected: When collecting samples, record the time the sample is first collected. Use of the 24-hour military clock will avoid a.m. or p.m. designations (e.g., 1815 instead of 6:15 p.m.). Record local time; the laboratory is responsible for calculating holding times to local time.

Lab ID: This is for laboratory use only.

Box 7 **Matrix/QC:** Identify the matrix (e.g., water, soil, air, tissue, fresh water sediment, marine sediment, or product). If a sample is expected to contain high analyte concentrations (e.g., a tank bottom sludge or distinct product layer), notify the laboratory in the comment section. Mark an “X” for the sample(s) that have extra volume for laboratory QC matrix spike/matrix spike duplicate (MS/MSD) purposes. The sample provided for MS/MSD purposes is usually a field duplicate.

Box 8 **Analytical Parameters:** Enter the parameter by descriptor and the method number desired (e.g., BTEX 8260B, PAHs 8270C, etc.). Whenever practicable, list the parameters as they appear in the laboratory subcontract to maintain consistency and avoid confusion.

If the COC does not have a specific box for number of sample containers, use the boxes below the analytical parameter, to indicate the number of containers collected for each parameter.

Box 9 **Sampler’s Signature:** The person who collected samples must sign here.

Relinquished By: The person who turned over the custody of the samples to a second party other than an express mail carrier, such as FedEx or DHL, must sign and date here.

Received By: Typically, a representative of the receiving laboratory signs and dates here. Or, a field crew member who delivered the samples in person from the field to the laboratory might sign here. A courier, such as FedEx or DHL, does not sign here because they do not open the coolers. It must also be used by the prime contracting laboratory when samples are to be sent to a subcontractor.

Relinquished By: In the case of subcontracting, the primary laboratory will sign and date the Relinquished By space and fill out an additional COC to accompany the samples being subcontracted.

Received By (Laboratory): This space is for the final destination (e.g., at a subcontracted laboratory). A representative of the final destination (e.g., subcontracted laboratory) must sign and date here.

Box 10 **Lab No. and Questions:** This box is to be filled in by the laboratory only.

Box 11 **Control Number:** This number is the “COC” followed by the first contractor identification number in that cooler, or contained on that COC. This control number must be unique (i.e., never used twice). Record the date the COC is completed. It should be the same date the samples are collected.

Box 12 **Total # of Containers:** Sum the number of containers in that row.

Box 13 **Totals:** Sum the number of containers in each column. Because COC forms contain different formats depending on who produced the form, not all of the information listed in items 1 to 13 may be recorded; however, as much of this information as possible shall be included.

6.0 Quality Control and Assurance

6.1 Recordkeeping, sample labeling, and chain-of-custody activities must incorporate quality control measures to ensure accuracy and completeness.

6.2 Deviations from this procedure or the project-specific project work plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

7.0 Records, Data Analysis, Calculations

7.1 The COC/analytical request form shall be faxed approximately daily to the **Project Laboratory Coordinator** for verification of accuracy. Following the completion of sampling activities, the sample logbook and COC forms will be transmitted to the **Project Manager** for storage in project files. The **data validators** shall receive a copy also. The original COC/analytical request form shall be submitted by the **laboratory** along with the data delivered. Any changes to the analytical requests that are required shall be made in writing to the laboratory. A copy of this written change shall be sent to the data validators and placed in the project files. The reason for the change shall be included in the project files so that recurring problems can be easily identified.

7.2 Deviations from this procedure or the project-specific sampling and analysis plan shall be documented in the records. Significant changes shall be approved by the **Program Quality Manager**.

8.0 Attachments or References

8.1 Attachment 1 – Chain-of-Custody Seal

8.2 Attachment 2 – Generic Chain-of-Custody/Analytical Request Form

8.3 Attachment 3 – Sample Completed Chain-of-Custody

8.4 Attachment 4 – Sample Out-of-Control Form

8.5 Environmental Protection Agency, United States (EPA). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.* Interim Final. EPA/540/G-89/004. Office of Emergency and Remedial Response. October.

8.6 EPA. 1992. *RCRA Groundwater Monitoring Draft Technical Guidance*. EPA/530/R-93/001. Office of Solid Waste. November.

8.7 EPA. 1997. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846. 3rd ed., Final Update IIIA. Office of Solid Waste.

8.8 Water Resources Control Board, State of California. 1988. *Technical Guidance Manual for Solid Waste Water Quality Assessment Test (SWAT) Proposals and Reports*. August.

8.9 Procedure 3-02, *Logbooks.*

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Attachment 1
Chain-of-Custody Seal

CHAIN-OF-CUSTODY SEAL

<table>
<tr><td rowspan="3">[LABORATORY]</td><td>SAMPLE NO.</td><td>DATE</td><td>SEAL BROKEN BY</td></tr>
<tr><td colspan="2">SIGNATURE</td><td>DATE</td></tr>
<tr><td colspan="3">PRINT NAME AND TITLE (Inspector, Analyst or Technician</td></tr>
</table>

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Attachment 2
Generic Chain-of-Custody/Analytical Request Form

M901376

CHAIN OF COSTODY RECORD

Page ____ of ____

Client/Project Name:	Project Location:
Project Number:	Field Logbook No.:
Sampler: (Print Name)/Affiliation: Signature:	Chain of Custody Tape No.:
	Send Results/Report to:

Analysis Requested

Field Sample No./Identification	Date	Time	Grab	Comp	Sample Container (Size/Mat'l)	Sample Type (Liquid, Sludge, Etc.)	Preservative	Field Filtered							Lab I.D.	Remarks

Relinquished by: (Print Name) Signature:	Date: Time:	Received by: (Print Name) Signature:	Date: Time:	Analytical Laboratory (Destination):
Relinquished by: (Print Name) Signature:	Date: Time:	Received by: (Print Name) Signature:	Date: Time:	
Relinquished by: (Print Name) Signature:	Date: Time:	Received by: (Print Name) Signature:	Date: Time:	Serial No.

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Attachment 3
Sample Completed Chain-of-Custody

Chain-of-Custody

11 Control Number: 96H0HC205

Date 8 / 3 / 96 Page 1 of 1

1

CTO/DO Manager:	Joe Smith
CTO/DO Name:	Former Navy Landfill
CTO/DO Number:	CTO 0250
Deliver results to the address above or as stated in contract	

2

Bill To:	CLEAN/RAC Contractor
Company:	company name
Address:	Oahu, Hawaii

3

Sample Disposal	by lab
Shipment Method:	Express Courier
Comments:	PACDIV Level D, Measure Cooler Temperature at Lab

4

Cooler No:	413		
QC Level:	PACDIV Level D	TAT:	Normal - per contract

6 Sample Data; 7 Matrix/QC; 8; 12; 5; 13

Sample ID (EPA ID)	Sample ID (Navy IRP Use Only)	Date Collected	Time Collected	Lab ID	Soil	Water	Other (drum, sludge, etc.)	Field Duplicate (MS/MSD)	TPH 8015B	CLP VOAs	CLP SVOAs	CLP Pesticides	CLP Metals	EPA 8080 (PCBs only)	EPA 8240	EPA 8270	Total Lead by EPA 6010				Extra Volume MS/MSD	HOLD	Total # of Containers
								container # (water):	1	2	2	1	2	1							2		
								Preservatives:	HCL	HCL			HNO3										
HC205		9/6/96	9:35		X				X	X	X	X	X	X									1
HC206		9/6/96	9:50		X				X	X	X	X	X	X									1
HC207		9/6/96	10:15		X				X	X	X	X	X	X									1
HC208		9/6/96	10:25		X				X	X	X	X	X	X									1
HC209		9/6/96	10:45		X				X	X	X	X	X	X									1
HC210		9/6/96	10:55			X		X		X													2
HC211		9/6/96	12:50			X			X	X	X	X	X	X									8
								TOTALS:	6	8	7	6	7	6									16

9

Samplers Signature	Date	Time
Relinquished By:	Date	Time
Received By:	Date	Time
Relinquished By:	Date	Time
Received By (LAB):	Date	Time

10 For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N
Received within holding time: Y or N
COC seal intact: Y or N
Any other problems: Y or N
If problems, Client contacted: Y or N
Date contacted: ___/___/___
Temperature (°C):

Original (white), Lab Copy (yellow), Field Copy (pink)

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Attachment 4
Sample Out-of-Control Form

OUT OF CONTROL FORM	Status	Date	Initial
	Noted OOC		
	Submit for CA*		
	Resubmit for CA*		
	Completed		

Date Recognized:	By:
Dated Occurred:	Matrix
Parameter (Test Code):	Method:
Analyst:	Supervisor:

Samples Affected (List by Accession AND Sample No.)

	1. Type of Event (Check all that apply)		2. Corrective Action (CA)* (Check all that apply)
	Calibration Corr. Coefficient <0.995		Repeat calibration
	%RSD>20%		Made new standards
	Blank >MDL		Reran analysis
	Does not meet criteria:		Sample(s) redigested and rerun
	Spike		Sample(s) reextracted and rerun
	Duplicate		Recalculated
	LCS		Cleaned system
	Calibration Verification		Ran standard additions
	Standard Additions		Notified
	MS/MSD		Other (please explain)
	BS/BSD		
	Surrogate Recovery		
	Calculations Error		
	Holding Times Missed		
	Other (Please explain	Comments:	

	3. Results of Corrective Action
	Return to Control (indicated with)
	Corrective Actions Not Successful - DATA IS TO BE FLAGGED with ______________.

Analyst:	Date:
Supervisor:	Date:
QA Department:	Date:

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Sample Handling, Storage, and Shipping

Procedure 3-04

1.0 Purpose and Scope

1.1 This standard operating procedure describes the actions to be used by personnel engaged in handling, storing, and transporting samples. The objective is to obtain samples of actual conditions with as little alteration as possible.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 Avoid lifting heavy coolers with back muscles; instead, use leg muscles or dollies.

2.2 Wear proper gloves, such as blue nitrile and latex, as defined in the project-specific health and safety plan, when handling sample containers to avoid contacting any materials that may have spilled out of the sample containers.

3.0 Terms and Definitions

None.

4.0 Training and Qualifications

4.1 The **Project Manager** is responsible for identifying instances of non-compliance with this procedure and ensuring that future sample transport activities comply with this procedure.

4.2 The **Field Manager** is responsible for ensuring that all samples are shipped according to this procedure.

4.3 **Field personnel** are responsible for the implementation of this procedure.

4.4 All **field personnel** are responsible for the implementation of this procedure.

5.0 Procedure

5.1 Handling and Storage

Immediately following collection, label all samples according to Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*. The lids of the containers shall not be sealed with duct tape, but may be covered with custody seals or placed directly into self-sealing bags. Place the sample containers in an insulated cooler with frozen gel packs (e.g., “blue ice”) or ice in double, sealed self-sealing bags. Samples should occupy the lower portion of the cooler, while the ice should occupy the upper portion. Place an absorbent material (e.g., proper absorbent cloth material) on the bottom of the cooler to contain liquids in case of spillage. Fill all empty space between sample containers with Styrofoam® “peanuts” or other appropriate material. Prior to shipping, wrap glass sample containers on the sides, tops, and bottoms with bubble wrap or other appropriate padding and/or surround them in Styrofoam to prevent breakage during transport. Pack all glass containers for water samples in an upright position, never stacked or on their sides. Prior to shipment, replace the ice or cold packs in the coolers so that samples will be maintained as close to 4 degrees Celsius (°C) as possible from the time of collection through transport to the analytical laboratory. Ship samples within 24 hours or on a schedule allowing the laboratory to meet holding times for analyses. The procedures for maintaining sample temperatures at 4°C pertain to all field samples.

5.2 Shipping

Follow all appropriate U.S. Department of Transportation regulations (e.g., 49 Code of Federal Regulations [CFR], Parts 171-179) for shipment of air, soil, water, and other samples. Elements of these procedures are summarized below.

5.2.1 Hazardous Materials Shipment

Field personnel must state whether any sample is suspected to be a hazardous material. A sample should be assumed hazardous unless enough evidence exists to indicate it is non-hazardous. If not suspected to be hazardous, shipments may be made as described in the Section 5.2.2 for non-hazardous materials. If hazardous, follow the procedures summarized below.

Any substance or material that is capable of posing an unreasonable risk to life, health, or property when transported is classified as hazardous. Perform hazardous materials identification by checking the list of dangerous goods for that particular mode of transportation. If not on that list, materials can be classified by checking the Hazardous Materials Table (49 CFR 172.102 including Appendix A) or by determining if the material meets the definition of any hazard class or division (49 CFR Part 173), as listed in Attachment 2.

All **persons shipping hazardous materials** must be properly trained in the appropriate regulations, as required by HM-126F, Training for Safe Transportation of Hazardous Materials (49 CFR HM-126F Subpart H). The training covers loading, unloading, handling, storing, and transporting of hazardous materials, as well as emergency preparedness in the case of accidents. **Carriers**, such as commercial couriers, must also be trained. Modes of shipment include air, highway, rail, and water.

When shipping hazardous materials, including bulk chemicals or samples suspected of being hazardous, the proper shipping papers (49 CFR 172 Subpart C), package marking (49 CFR 172 Subpart D), labeling (49 CFR 172 Subpart E), placarding (49 CFR 172 Subpart F, generally for carriers), and packaging must be used.

Attachment 1 shows an example of proper package markings. Refer to a copy of 49 CFR each time hazardous materials/potentially hazardous samples are shipped.

According to Section 2.7 of the International Air Transport Association Dangerous Goods Regulations publication, very small quantities of certain dangerous goods may be transported without certain marking and documentation requirements as described in 49 CFR Part 172; however, other labeling and packing requirements must still be followed. Attachment 2 shows the volume or weight for different classes of substances. A “Dangerous Goods in Excepted Quantities” label must be completed and attached to the associated shipping cooler (Attachment 3). Certain dangerous goods are not allowed on certain airlines in any quantity.

As stated in item 4 of Attachment 4, the Hazardous Materials Regulations do not apply to hydrochloric acid (HCl), nitric acid (HNO_3), sulfuric acid (H_2SO_4), and sodium hydroxide (NaOH) added to water samples if their pH or percentage by weight criteria is met. These samples may be shipped as non-hazardous materials as discussed below.

5.2.2 Non-Hazardous Materials Shipment

If the samples are suspected to be non-hazardous based on previous site sample results, field screening results, or visual observations, if applicable, then samples may be shipped as non-hazardous.

When a cooler is ready for shipment to the laboratory, place two copies of the chain-of-custody form inside a self-sealing bag and tape it to the inside of the insulated cooler. Then, seal the cooler with waterproof tape and label it with “Fragile,” “This-End-Up” (or directional arrows pointing up), or other appropriate notices. Place chain-of-custody seals on the coolers as discussed in Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*.

5.2.3 Shipments from Outside the Continental United States

Shipment of sample coolers to the United States from locations outside the continental United States is controlled by the U.S. Department of Agriculture (USDA) and is subject to their inspection and regulation. A “USDA Soil Import Permit” is required to prove that the receiving analytical laboratory is certified by the USDA to receive and properly dispose of soil. In addition, all sample coolers must be inspected by a **USDA representative**, affixed with a label indicating that the coolers contain environmental samples, and accompanied by shipping forms stamped by the **USDA inspector** prior to shipment.

In addition, the U.S. Customs Service must clear samples shipped from U.S. territorial possessions or foreign countries upon entry into the United States. As long as the commercial invoice is properly completed (see below), shipments typically pass through U.S. Customs Service without the need to open coolers for inspection.

Completion and use of proper paperwork will, in most cases, minimize or eliminate the need for the USDA and U.S. Customs Service to inspect the contents. Attachment 5 shows an example of how paperwork may be placed on the outside of coolers for non-hazardous materials. For hazardous materials, refer to Section 5.2.1.

In summary, tape the paperwork listed below to the outside of the coolers to accompany sample shipments. If a shipment is made up of multiple pieces (e.g., more than one cooler), the paperwork need only be attached to one cooler, provided that the **courier** agrees. All other coolers in the shipment need only to be taped and have the address and chain-of-custody seals affixed.

1. **Courier Shipping Form & Commercial Invoice:** See Attachment 6 and Attachment 7 for examples of the information to be included on the commercial invoices for soil and water, respectively. Place the courier shipping form and commercial invoice inside a clear, plastic, adhesive-backed pouch that adheres to the package (typically supplied by the courier) and place it on the cooler lid as shown in Attachment 5.
2. **Soil Import Permit (soil only):** See Attachment 8 and Attachment 9 for examples of the soil import permit and soil samples restricted entry labels, respectively. The **laboratory** shall supply these documents prior to mobilization. The USDA often stops shipments of soil without these documents. Staple together the 2-inch $\times$ 2-inch USDA label (described below) and soil import permit, and place them inside a clear plastic pouch. The **courier** typically supplies the clear, plastic, adhesive-backed pouches that adhere to the package.

   Placing one restricted entry label as shown in Attachment 5 (covered with clear packing tape) and one stapled to the actual permit is suggested.

   The USDA does not control water samples, so the requirements for soil listed above do not apply.
3. **Chain-of-Custody Seals:** The **laboratory** should supply the seals. **Field personnel** must sign and date these. At least two seals should be placed in such a manner that they

stick to both the cooler lid and body. Placing the seals over the tape (as shown in Attachment 5), then covering it with clear packing tape is suggested. This prevents the seal from coming loose and enables detection of tampering.

4. **Address Label:** Affix a label stating the destination (laboratory address) to each cooler.
5. **Special Requirements for Hazardous Materials:** See Section 5.2.1.

Upon receipt of sample coolers at the laboratory, the **sample custodian** shall inspect the sample containers as discussed in Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*. The samples shall then be immediately extracted and/or analyzed, or stored in a refrigerated storage area until they are removed for extraction and/or analysis. Whenever the samples are not being extracted or analyzed, they shall be returned to refrigerated storage.

6.0 Quality Control and Assurance

6.1 Sample handling, storage, and shipping must incorporate quality control measures to ensure conformance to these and the project requirements.

7.0 Records, Data Analysis, Calculations

7.1 Maintain records as required by implementing these procedures.

7.2 Deviations from this procedure or the project-specific sampling and analysis plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

8.0 Attachments or Reference

8.1

8.2 Attachment 1 – Example Hazardous Material Package Marking

8.3 Attachment 2 – Packing Groups

8.4 Attachment 3 – Label for Dangerous Goods in Excepted Quantities

8.5 Attachment 4 – SW-846 Preservative Exception

8.6 Attachment 5 – Non-Hazardous Material Cooler Marking Figure for Shipment from Outside the Continental United States

8.7 Attachment 6 – Commercial Invoice – Soil

8.8 Attachment 7 – Commercial Invoice – Water

8.9 Attachment 8 – Soil Import Permit

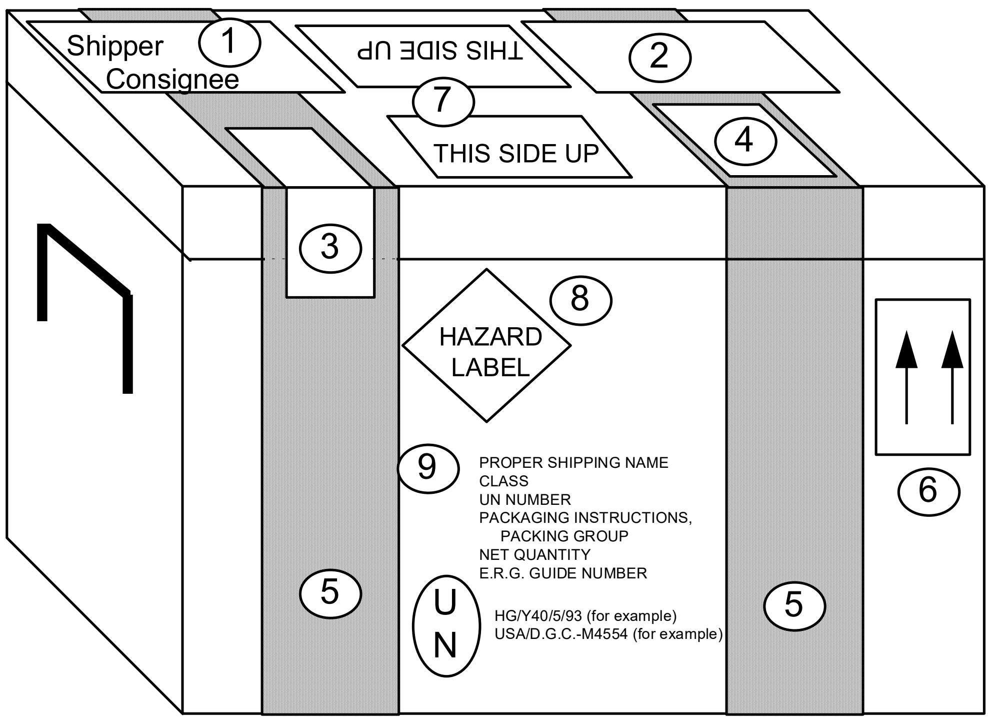
8.10 Attachment 9 – Soil Samples Restricted Entry Labels

8.11 EM 200-1-6, *Chemical Quality Assurance for HTRW Projects,* October 1997.

8.12 NAVSEA T0300-AZ-PRO-010. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*. August 2009.

8.13 Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*.

Attachment 1
Example Hazardous Material Package Marking



1	**AIR BILL/COMMERCIAL INVOICE**	6	**DIRECTION ARROWS STICKER - TWO REQUIRED**
2	**USDA PERMIT (Letter to Laboratory from USDA)**	7	**THIS SIDE UP STICKERS**
3	**CUSTODY SEAL**	8	**HAZARD LABEL**
4	**USDA 2" X 2" SOIL IMPORT PERMIT**	9	**HAZARDOUS MATERIAL INFORMATION**
5	**WATERPROOF STRAPPING TAPE**	10	**PACKAGE SPECIFICATIONS**

Attachment 2
Packing Groups

PACKING GROUP OF THE SUBSTANCE	PACKING GROUP 1		PACKING GROUP II		PACKING GROUP III	
CLASS or DIVISION of PRIMARY or SUBSIDIARY RISK	Packagings		Packagings		Packagings	
	Inner	Outer	Inner	Outer	Inner	Outer
1: Explosives	---------------------------- Forbidden (Note A) ----------------------------------					
2.1: Flammable Gas	---------------------------- Forbidden (Note B) ----------------------------------					
2.2: Non-Flammable, non-toxic gas	---------------------------- See Notes A and B ----------------------------------					
2.3: Toxic gas	---------------------------- Forbidden (Note A) ----------------------------------					
3. Flammable liquid	30 mL	300 mL	30 mL	500 mL	30 mL	1 L
4.1 Self-reactive substances	Forbidden		Forbidden		Forbidden	
4.1: Other flammable solids	Forbidden		30 g	500 g	30 g	1 kg
4.2: Pyrophoric substances	Forbidden		Not Applicable		Not Applicable	
4.2 Spontaneously combustible substances	Not Applicable		30 g	500 g	30 g	1 kg
4.3: Water reactive substances	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
5.1: Oxidizers	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
5.2: Organic peroxides (Note C)	See Note A		30 g or 30 mL	500 g or 250 mL	Not Applicable	
6.1: Poisons - Inhalation toxicity	Forbidden		1 g or 1 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
6.1: Poisons - oral toxicity	1 g or 1 mL	300 g or 300 mL	1 g or 1 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
6.1: Poisons - dermal toxicity	1 g or 1 mL	300 g or 300 mL	1 g or 1 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
6.2: Infectious substances	---------------------------- Forbidden (Note A) ----------------------------------					
7: Radioactive material (Note D)	---------------------------- Forbidden (Note A) ----------------------------------					
8: Corrosive materials	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
9: Magnetized materials	---------------------------- Forbidden (Note A) ----------------------------------					
9: Other miscellaneous materials (Note E)	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L

Note A: *Packing groups are not used for this class or division.*
Note B: *For inner packagings, the quantity contained in receptacle with a water capacity of 30 mL. For outer packagings, the sum of the water capacities of all the inner packagings contained must not exceed 1 L.*
Note C: *Applies only to Organic Peroxides when contained in a chemical kit, first aid kit or polyester resin kit.*
Note D: *See 6.1.4.1, 6.1.4.2, and 6.2.1.1 through 6.2.1.7, radioactive material in excepted packages.*
Note E: *For substances in Class 9 for which no packing group is indicated in the List of Dangerous Goods, Packing Group II quantities must be used.*

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Attachment 3
Dangerous Goods in Excepted Quantities

DANGEROUS GOODS IN EXCEPTED QUANTITIES

This package contains dangerous goods in excepted small quantities and is in all respects in compliance with the applicable international and national government regulations and the IATA Dangerous Goods Regulations.

____
Signature of Shipper

_______________________ _____________________
Title Date

____

____
Name and address of Shipper

This package contains substance(s) in Class(es)
(check applicable box(es))

Class:	2	3	4	5	6	8	9
	☐	☐	☐	☐	☐	☐	☐

and the applicable UN Numbers are:

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Attachment 4
SW-846 Preservative Exception

Measurement	Vol. Req. (mL)	Container[2]	Preservative[3,4]	Holding Time[5]
MBAS	250	P, G	Cool, 4ºC	48 Hours
NTA	50	P, G	Cool, 4ºC	24 Hours

1. More specific instructions for preservation and sampling are found with each procedure as detailed in this manual. A general discussion on sampling water and industrial wastewater may be found in ASTM, Part 31, p. 72-82 (1976) Method D-3370.

2. Plastic (P) or Glass (G). For metals, polyethylene with a polypropylene cap (no liner) is preferred.

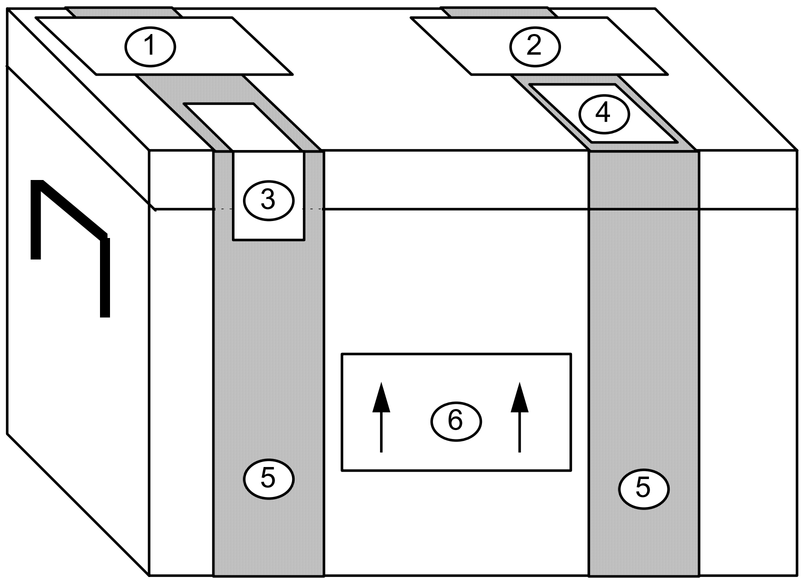
3. Sample preservation should be performed immediately upon sample collection. For composite samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4ºC until compositing and sample splitting is completed.

4. When any sample is to be shipped by common carrier or sent through the United States Mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. for the preservation requirements of Table 1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentration of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

5. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of sample under study are stable for the longer time, and has received a variance from the Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.

6. Should only be used in the presence of residual chlorine.

Attachment 5
Non-Hazardous Material Cooler Marking Figure for Shipment from Outside the Continental United States



1 AIR BILL/COMMERCIAL INVOICE
2 USDA PERMIT (Letter to Laboratory from USDA)
3 CUSTODY SEAL
4 USDA 2" X 2" SOIL IMPORT PERMIT
5 WATERPROOF STRAPPING TAPE
6 DIRECTION ARROWS STICKER - TWO REQUIRED

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Attachment 6
Commercial Invoice – Soil

DATE OF EXPORTATION	EXPORT REFERENCES (i.e., order no., invoice no., etc.)
1/1/94	**<CTO #>**
SHIPPER/EXPORTER (complete name and address) **Joe Smith** **Ogden** **c/o<hotel name>** **<hotel address>**	CONSIGNEE **Sample Receipt** **<Lab Name>** **<Lab Address>**
COUNTRY OF EXPORT **Guam, USA**	IMPORTER - IF OTHER THAN CONSIGNEE
COUNTRY OF ORIGIN OF GOODS **Guam, USA**	
COUNTRY OF ULTIMATE DESTINATION **USA**	

INTERNATIONAL AIR WAYBILL NO.		(NOTE: All shipments must be accompanied by a Federal Express International Air Waybill)

MARKS/NOS	NO. OF PKGS	TYPE OF PACKAGING	FULL DESCRIPTION OF GOODS	QTY	UNIT OF MEASURE	WEIGHT	UNIT VALUE	TOTAL VALUE
	3	**coolers**	**Soil samples for laboratory analysis only**				**$1.00**	**$3.00**
	TOTAL NO. OF PKGS.					TOTAL WEIGHT		TOTAL INVOICE VALUE
	3							**$3.00**
								Check one ☐ F.O.B. ☐ C&F ☐ C.I.F.

THES

E COMMODITIES ARE LICENSED FOR THE ULTIMATE DESTINATION SHOWN.

DIVERSION CONTRARY TO UNITED STATES LAW IS PROHIBITED.

I DECLARE ALL THE INFORMATION CONTAINED IN THIS INVOICE TO BE TRUE AND CORRECT

SIGNATURE OF SHIPPER/EXPORTER (Type name and title and sign)

Joe Smith, Ogden	**Joe Smith**	**1/1/94**
Name/Title	Signature	Date

Attachment 7
Commercial Invoice – Water

DATE OF EXPORTATION	EXPORT REFERENCES (i.e., order no., invoice no., etc.)
1/1/94	**<CTO #>**
SHIPPER/EXPORTER (complete name and address) **Joe Smith** **Ogden** **c/o<hotel name>** **<hotel address>**	CONSIGNEE **Sample Receipt** **<Lab Name>** **<Lab Address>**
COUNTRY OF EXPORT **Guam, USA**	IMPORTER - IF OTHER THAN CONSIGNEE
COUNTRY OF ORIGIN OF GOODS **Guam, USA**	
COUNTRY OF ULTIMATE DESTINATION **USA**	

INTERNATIONAL AIR WAYBILL NO.

(NOTE: All shipments must be accompanied by a Federal Express International Air Waybill)

MARKS/NOS	NO. OF PKGS	TYPE OF PACKAGING	FULL DESCRIPTION OF GOODS	QTY	UNIT OF MEASURE	WEIGHT	UNIT VALUE	TOTAL VALUE
	3	**coolers**	**Water samples for laboratory analysis only**				**$1.00**	**$3.00**
	TOTAL NO. OF PKGS.					TOTAL WEIGHT		TOTAL INVOICE VALUE
	3							**$3.00**

Check one
- ☐ F.O.B.
- ☐ C&F
- ☐ C.I.F.

THESE COMMODITIES ARE LICENSED FOR THE ULTIMATE DESTINATION SHOWN.

DIVERSION CONTRARY TO UNITED STATES LAW IS PROHIBITED.

I DECLARE ALL THE INFORMATION CONTAINED IN THIS INVOICE TO BE TRUE AND CORRECT

SIGNATURE OF SHIPPER/EXPORTER (Type name and title and sign)

Joe Smith, Ogden **Joe Smith** **1/1/94**

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Attachment 8
Soil Import Permit

UNITED STATES DEPARTMENT OF AGRICULTURE

Animal and Plant Health Inspection Service

Plant Protection and Quarantine

Soil Permit

Permit Number: S-52299

Issued To: Columbia Analytical Services
(Lee Wolf)
1317 S. 13th Avenue
Kelso, Washington 98626

TELEPHONE: (360) 577-7222

Under the authority of the Federal Plant Pest Act of May 23, 1957, permission is hereby granted to the facility/individual named above subject to the following conditions:

1. Valid for shipments of soil not heat treated at the port of entry, only if a compliance agreement (PPQ Form 519) has been completed and signed. Compliance Agreements and Soil permits are non-transferable. If you hold a Soil Permit and you leave your present employer or company, you must notify your local USDA office promptly.
2. To be shipped in sturdy, leakproof, containers.
3. To be released without treatment at the port of entry.
4. To be used only for analysis and only in the facility of the permittee at Columbia Analytical Services, located in Kelso, Washington.
5. No use of soil for growing purposes is authorized, including the isolation or culture of organisms imported in soil.
6. All unconsumed soil, containers, and effluent is to be autoclaved, incinerated, or heat treated by the permittee at the conclusion of the project as approved and prescribed by Plant Protection and Quarantine.
7. This permit authorizes shipments from all foreign sources, including Guam, Hawaii, Puerto Rico, and the U.S. Virgin Islands through any U.S. port of entry.

JUNE 30, 2006
Expiration Date

Deborah M. Knott
Approving Official DEBORAH M. KNOTT

WARNING: Any alteration, forgery, or unauthorized use of this Federal form is subject to civil penalties of up to $250,000 (7 U.S.C. s 7734(b)) or punishable by a fine of not more than $10,000, or imprisonment of not more than 5 years, or both (18 U.S.C. s 1001).

PPQ FORM 525B (8/94)

Pt. 1 - PERMITTEE

Attachment 9
Soil Samples Restricted Entry Labels

U.S. DEPARTMENT OF AGRICULTURE

ANIMAL AND PLANT HEALTH INSPECTION SERVICE

PLANT PROTECTION AND QUARANTINE

HYATTSVILLE, MARYLAND 20782

SOIL SAMPLES

RESTRICTED ENTRY

The material contained in this package is imported under authority of the Federal Plant Pest Act of May 23, 1957.

For release without treatment if addressee is currently listed as approved by Plant Protection and Quarantine.

PPQ FORM 550 *Edition of 12/77 may be used*

(JAN 83)

AECOM

Investigation Derived Waste Management

Procedure 3-05

1.0 Purpose and Scope

This standard operating procedure (SOP) describes activities and responsibilities of AECOM personnel responsible for the management of investigation-derived waste (IDW). The purpose of this procedure is to provide guidance for the minimization, handling, labelling, temporary storage, inventory, classification, and disposal of IDW generated during field activities. This procedure will also apply to personal protective equipment (PPE), sampling equipment, decontamination fluids, non-IDW trash, non-indigenous IDW, and hazardous waste generated during implementation of remedial investigations or remedial actions.

This procedure shall serve as management-approved professional guidance for AECOM fieldwork and is consistent with protocol in the Uniform Federal Policy-Quality Assurance Project Plan (DoD 2005). As professional guidance for specific activities, this procedure is not intended to obviate the need for professional judgment during unforeseen circumstances. Deviations from this procedure while planning or executing planned activities must be approved by both the Project Manager and the Quality Assurance (QA) Manager or Technical Director, and documented.

2.0 Safety

The health and safety considerations for the work associated with this SOP, including both potential physical and chemical hazards, will be addressed in the project Accident Prevention Plan/Site-specific Safety and Health Plan (APP/SSHP).

All **Field Personnel** responsible for IDW management must adhere to the APP/SSHP and must wear the PPE specified in the site-specific APP/SSHP. Generally, this includes, at a minimum, steel-toed boots or steel-toed rubber boots, safety glasses, American National Standards Institute-standard hard hats, and hearing protection (if heavy equipment is in operation). If safe alternatives are not achievable, discontinue site activities immediately.

3.0 Terms and Definitions

None.

4.0 Training and Qualifications

4.1 The **Project Manager** is responsible for ensuring that IDW management activities comply with this procedure. The **Project Manager** is responsible for ensuring that all personnel involved in IDW management shall have the appropriate education, experience, and training to perform their assigned tasks.

4.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.3 The **Field Manager** is responsible for ensuring that all IDW is managed according to this procedure.

4.4 All **Field Personnel** are responsible for the implementation of this procedure.

5.0 Equipment and Supplies

The equipment and supplies required for implementation of this SOP include the following:

- Containers for waste (e.g., [U.S. Department of Transportation] DOT approved 55-gallon open and closed top drums) and material to cover waste to protect from weather (e.g., plastic covering);
- Hazardous /non-hazardous waste drum labels (weatherproof);
- Permanent marking pens;
- Inventory forms for project file;
- Plastic garbage bags, zip lock storage bags, roll of plastic sheeting; and
- Steel-toed boots, chemical resistant gloves, coveralls, safety glasses, and any other PPE required in the HASP.

6.0 Procedure

The following procedures are used to handle the IDW.

6.1 Drum Handling

6.1.1 IDW shall be containerized using DOT approved drums. The drums shall be made of steel or plastic, have a 55-gallon capacity, be completely painted or opaque, and have removable lids (i.e., United Nations Code 1A2 or 1H2). Typically 55-gallon drums are used, however small drums may be used depending on the amount of waste generated. New steel drums are preferred over recycled drums.

6.1.2 Recycled drums should not be used for hazardous waste, PCBs or other regulated shipments. For short-term storage of liquid IDW prior to discharge, double-walled bulk steel or plastic storage tanks may be used. For this scenario, consider the scheduling and cost-effectiveness of this type of bulk storage, treatment, and discharge system versus longer-term drum storage.

6.1.3 For long-term IDW storage at other project locations, the DOT approved drums with removable lids are recommended. Verify the integrity of the foam or rubber sealing ring located on the underside of some drum lids prior to sealing drums containing IDW liquids.

6.1.4 If the ring is only partially attached to the drum lid, or if a portion of the ring is missing, select another drum lid with a sealing ring that is in sound condition.

6.1.5 To prepare IDW drums for labeling, wipe clean the outer wall surfaces and drum lids of all material that might prevent legible and permanent labeling. If potentially contaminated material adheres to the outer surface of a drum, wipe that material from the drum, and segregate the paper towel or rag used to remove the material with visibly soiled PPE and disposable sampling equipment. Label all IDW drums and place them on pallets prior to storage.

6.2 Labelling

6.2.1 Containers used to store IDW must be properly labelled. Two general conditions exist: 1) from previous studies or on-site data, waste characteristics are known to be either hazardous or nonhazardous; or 2) waste characteristics are unknown until additional data are obtained.

6.2.2 For situations where the waste characteristics are known, the waste containers should be packaged and labelled in accordance with state regulations and any federal regulations that may govern the labelling of waste.

6.2.3 The following information shall be placed on all non-hazardous waste labels:

- Description of waste (i.e., purge water, soil cuttings);
- Contact information (i.e., contact name and telephone number);
- Date when the waste was first accumulated.

6.2.4 The following information shall be placed on all hazardous waste labels:

- Description of waste (i.e., purge water, soil cuttings);
- Generator information (i.e., name, address, contact telephone number);
- EPA identification number (supplied by on-site client representative);
- Date when the waste was first accumulated.

6.2.5 When the final characterization of a waste is unknown, a notification label should be placed on the drum with the words "waste characterization pending analysis" and the following information included on the label:

- Description of waste (i.e., purge water, soil cuttings);
- Contact information (i.e., contact name and telephone number);
- Date when the waste was first accumulated.

6.2.6 Once the waste has been characterized, the label should be changed as appropriate for a nonhazardous or hazardous waste.

6.2.7 Waste labels should be constructed of a weatherproof material and filled out with a permanent marker to prevent being washed off or becoming faded by sunlight. It is recommended that waste labels be placed on the side of the container, since the top is more subject to weathering. However, when multiple containers are accumulated together, it also may be helpful to include labels on the top of the containers to facilitate organization and disposal.

6.2.8 Each container of waste generated shall be recorded in the field notebook used by the person responsible for labelling the waste. After the waste is disposed of, either by transportation off-site or disposal on-site in an approved disposal area, an appropriate record shall be made in the same field notebook to document proper disposition of IDW.

6.3 Types of Site Investigation Waste

Several types of waste are generated during site investigations that may require special handling. These include solid, liquid, and used PPE, as discussed further below.

<u>Solid Waste</u>

Soil cuttings from boreholes will typically be placed in containers unless site specific requirements allow for soil cuttings to be placed back into the borehole after drilling is complete. Drilling mud generated during investigation activities shall be collected in containers. Covers should be included on the containers and must be secured at all times and only open during filling activities. The containers shall be labelled in accordance with this SOP. An inventory containing the source, volume, and description of material put in the containers shall be logged on prescribed forms and kept in the project file.

Non-hazardous solid waste can be disposed on-site in the designated site landfill or in a designated evaporation pond if it is liquefied. Hazardous wastes must be disposed off-site at an approved hazardous waste landfill.

Liquid Waste

Groundwater generated during monitoring well development, purging, and sampling can be collected in truck-mounted containers and/or other transportable containers (i.e., 55-gallon drums). Lids or bungs on drums must be secured at all times and only open during filling or pumping activities. The containers shall be labelled in accordance with this SOP. Non-hazardous liquid waste can be disposed of in one of the designated lined evaporation ponds on-site. Hazardous wastes must be handled separately and disposed off-site at an approved hazardous waste facility.

Personal Protective Equipment

PPE that is generated throughout investigation activities shall be placed in plastic garbage bags. If the solid or liquid waste that was being handled is characterized as hazardous waste, then the corresponding PPE should also be disposed as hazardous waste. If not, all PPE should be disposed as non-hazardous waste in the designated on-site landfill. Trash that is generated as part of field activities may be disposed of in the landfill as long as the trash was not exposed to hazardous media.

6.4 Waste Accumulation On-Site

6.4.1 Solid, liquid, or PPE waste generated during investigation activities that are classified as nonhazardous or “characterization pending analysis” should be disposed of as soon as possible. Until disposal, such containers should be inventoried, stored as securely as possible, and inspected regularly, as a general good practice.

6.4.2 Solid, liquid, or PPE waste generated during investigation activities that are classified as hazardous shall not be accumulated on-site longer than 90 days. All hazardous waste containers shall be stored in a secured storage area. The following requirements for the hazardous waste storage area must be implemented:

- Proper hazardous waste signs shall be posted as required by any state or federal statutes that may govern the labelling of waste;
- Secondary containment to contain spills;
- Spill containment equipment must be available;
- Fire extinguisher;
- Adequate aisle space for unobstructed movement of personnel.

6.4.3 Weekly storage area inspections shall be performed and documented to ensure compliance with these requirements. Throughout the project, an inventory shall be maintained to itemize the type and quantity of the waste generated.

6.5 Waste Disposal

6.5.1 Solid, liquid, and PPE waste will be characterized for disposal through the use of client knowledge, laboratory analytical data created from soil or groundwater samples gathered during the field activities, and/or composite samples from individual containers.

6.5.2 All waste generated during field activities will be stored, transported, and disposed of according to applicable state, federal, and local regulations. All wastes classified as hazardous will be disposed of at a licensed treatment storage and disposal facility or managed in other approved manners.

6.5.3 In general, waste disposal should be carefully coordinated with the facility receiving the waste. Facilities receiving waste have specific requirements that vary even for non-hazardous waste, so characterization should be conducted to support both applicable regulations and facility requirements.

6.6 **Regulatory Requirements**

The following federal and state regulations shall be used as resources for determining waste characteristics and requirements for waste storage, transportation, and disposal:

- Code of Federal Regulations (CFR), Title 40, Part 261;
- CFR, Title 49, Parts 172, 173, 178, and 179.

6.7 **Waste Transport**

A state-certified hazardous waste hauler shall transport all wastes classified as hazardous. Typically, the facility receiving any waste can coordinate a hauler to transport the waste. Shipped hazardous waste shall be disposed of in accordance with all RCRA/USEPA requirements. All waste manifests or bills of lading will be signed either by the client or the client's designee.

7.0 Quality Control and Assurance

7.1 Management of IDW must incorporate quality control measures to ensure conformance to these and the project requirements.

8.0 Records, Data Analysis, Calculations

8.1 Maintain records as required by implanting the procedures in this SOP.

8.2 Deviations from this procedure or the sampling and analysis plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

9.0 Attachments or References

Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual.* Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf.

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Equipment Decontamination

Procedure 3-06

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes methods of equipment decontamination, to be used for activities where samples for chemical analysis are collected or where equipment will need to be cleaned before leaving the site or before use in subsequent activities.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

It is the responsibility of the **Site Safety Officer (SSO)** to set up the site zones (i.e., exclusion, transition, and clean) and decontamination areas. Generally the decontamination area is located within the transition zone, upwind of intrusive activities, and serves as the washing area for both personnel and equipment to minimize the spread of contamination into the clean zone. Typically, for equipment, a series of buckets are set up on a visqueen-lined bermed area. Separate spray bottles containing cleaning solvents as described in this procedure or the project Work Plan (WP) and distilled water are used for final rinsing of equipment. Depending on the nature of the hazards and the site location, decontamination of heavy equipment, such as augers, pump drop pipe, and vehicles, may be accomplished using a variety of techniques.

All **Field Personnel** responsible for equipment decontamination must adhere to the site-specific Accident Prevention Plan/Site-specific Safety and Health Plan (APP/SSHP) and must wear the personal protective equipment (PPE) specified in the site-specific APP/SHP. Generally this includes, at a minimum, Tyvek® coveralls, steel-toed boots with boot covers or steel-toed rubber boots, safety glasses, American National Standards Institute-standard hard hats, and hearing protection (if heavy equipment is in operation). Air monitoring by the **SSO** may result in an upgrade to the use of respirators and cartridges in the decontamination area; therefore, this equipment must be available on site. If safe alternatives are not achievable, discontinue site activities immediately.

In addition to the aforementioned precautions, the following sections describe safe work practices that will be employed.

2.1 **Chemical Hazards associated with Equipment Decontamination**

- Avoid skin contact with and/or incidental ingestion of decontamination solutions and water.
- Utilize PPE as specified in the site-specific APP/SSHP to maximize splash protection.
- Refer to material safety data sheets, safety personnel, and/or consult sampling personnel regarding appropriate safety measures (i.e., handling, PPE including skin and respiratory).
- Take the necessary precautions when handling detergents and reagents.

2.2 **Physical Hazards associated with Equipment Decontamination**

- To avoid possible back strain, it is recommended to raise the decontamination area 1 to 2 feet above ground level.
- To avoid heat stress, over exertion, and exhaustion, it is recommended to rotate equipment decontamination among all site personnel.
- Take necessary precautions when handling field sampling equipment.

3.0 Terms and Definitions

None.

4.0 Training and Qualifications

4.1 The **Project Manager** is responsible for ensuring that decontamination activities comply with this procedure. The **Project Manager** is responsible for ensuring that all personnel involved in equipment decontamination shall have the appropriate education, experience, and training to perform their assigned tasks.

4.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.3 The **Field Manager** is responsible for ensuring that all field equipment is decontaminated according to this procedure.

4.4 All **Field Personnel** are responsible for the implementation of this procedure.

5.0 Procedure

Decontamination of equipment used in soil/sediment sampling, groundwater monitoring, well drilling and well development, as well as equipment used to sample groundwater, surface water, sediment, waste, wipe, asbestos, and unsaturated zone, is necessary to prevent cross-contamination and to maintain the highest integrity possible in collected samples. Planning a decontamination program requires consideration of the following factors:

- Location where the decontamination procedures will be conducted
- Types of equipment requiring decontamination
- Frequency of equipment decontamination
- Cleaning technique and types of cleaning solutions appropriate to the contaminants of concern
- Method for containing the residual contaminants and wash water from the decontamination process
- Use of a quality control measure to determine the effectiveness of the decontamination procedure

The following subsections describe standards for decontamination, including the frequency of decontamination, cleaning solutions and techniques, containment of residual contaminants and cleaning solutions, and effectiveness.

5.1 **Decontamination Area**

Select an appropriate location for the decontamination area at a site based on the ability to control access to the area, the ability to control residual material removed from equipment, the need to store clean equipment, and the ability to restrict access to the area being investigated. Locate the decontamination area an adequate distance away and upwind from potential contaminant sources to avoid contamination of clean equipment.

5.2 **Types of Equipment**

Drilling equipment that must be decontaminated includes drill bits, auger sections, drill-string tools, drill rods, split barrel samplers, tremie pipes, clamps, hand tools, and steel cable. Decontamination of monitoring well development and groundwater sampling equipment includes submersible pumps, bailers, interface probes, water level meters, bladder pumps, airlift pumps, peristaltic pumps, and lysimeters. Other sampling equipment that requires decontamination includes, but is not limited to, hand trowels, hand augers, slide hammer samplers, shovels, stainless-steel spoons and bowls, soil sample liners and caps, wipe sampling templates, composite liquid waste samplers, and dippers. Equipment with a porous surface, such as rope, cloth hoses, and wooden blocks, cannot be thoroughly decontaminated and shall be properly disposed of after one use.

5.3 **Frequency of Equipment Decontamination**

Decontaminate down-hole drilling equipment and equipment used in monitoring well development and purging prior to initial use and between each borehole or well. Down-hole drilling equipment, however, may require more frequent cleaning to prevent cross-contamination between vertical zones within a single borehole. When drilling through a shallow contaminated zone and installing a surface casing to seal off the contaminated zone, decontaminate the drilling tools prior to drilling deeper. Initiate groundwater sampling by sampling groundwater from the monitoring well where the least contamination is suspected. Decontaminate groundwater, surface water, and soil sampling devices prior to initial use and between collection of each sample to prevent the possible introduction of contaminants into successive samples.

5.4 **Cleaning Solutions and Techniques**

Decontamination can be accomplished using a variety of techniques and fluids. The preferred method of decontaminating major equipment, such as drill bits, augers, drill string, and pump drop-pipe, is steam cleaning. To steam clean, use a portable, high-pressure steam cleaner equipped with a pressure hose and fittings. For this method, thoroughly steam wash equipment and rinse it with potable tap water to remove particulates and contaminants.

A rinse decontamination procedure is acceptable for equipment such as bailers, water level meters, new and re-used soil sample liners, and hand tools. The decontamination procedure shall consist of the following: (1) wash with a non-phosphate detergent (Alconox®, Liquinox®, or other suitable detergent) and potable water solution; (2) rinse with potable water; (3) spray with laboratory-grade isopropyl alcohol; (4) rinse with deionized or distilled water; and (5) spray with deionized or distilled water. If possible, disassemble equipment prior to cleaning. Add a second wash at the beginning of the process if equipment is very soiled.

Decontaminating submersible pumps requires additional effort because internal surfaces become contaminated during usage. Decontaminate these pumps by washing and rinsing the outside surfaces using the procedure described for small equipment or by steam cleaning. Decontaminate the internal surfaces by recirculating fluids through the pump while it is operating. This recirculation may be done using a relatively long (typically 4 feet) large-diameter pipe (4-inch or greater) equipped with a bottom cap. Fill the pipe with the decontamination fluids, place the pump within the capped pipe, and operate the pump while recirculating the fluids back into the pipe. The decontamination sequence shall include: (1) detergent and potable water; (2) potable water rinse; (3) potable water rinse; and (4) deionized water rinse. Change the decontamination fluids after each decontamination cycle.

Solvents other than isopropyl alcohol may be used, depending upon the contaminants involved. For example, if polychlorinated biphenyls or chlorinated pesticides are contaminants of concern, hexane may be used as the decontamination solvent; however, if samples are also to be analyzed for volatile organics, hexane shall not be used. In addition, some decontamination solvents have health effects that must be considered. Decontamination water shall consist of distilled or deionized water. Steam-distilled water shall not be used in the decontamination process as this type of water usually contains elevated concentrations of metals. Decontamination solvents to be used during field activities will be specified in the project WP or SAP.

Rinse equipment used for measuring field parameters, such as pH (indicates the hydrogen ion concentration – acidity or basicity), temperature, specific conductivity, and turbidity with deionized or distilled water after each measurement. Also wash new, unused soil sample liners and caps with a fresh detergent solution and rinse them with potable water followed by distilled or deionized water to remove any dirt or cutting oils that might be on them prior to use.

5.5 Containment of Residual Contaminants and Cleaning Solutions

A decontamination program for equipment exposed to potentially hazardous materials requires a provision for catchment and disposal of the contaminated material, cleaning solution, and wash water.

When contaminated material and cleaning fluids must be contained from heavy equipment, such as drill rigs and support vehicles, the area must be properly floored, preferably with a concrete pad that slopes toward a sump pit. If a concrete pad is impractical, planking can be used to construct solid flooring that is then covered by a nonporous surface and sloped toward a collection sump. If the decontamination area lacks a collection sump, use plastic sheeting and blocks or other objects to create a bermed area for collection of equipment decontamination water. Situate items, such as auger flights, which can be placed on metal stands or other similar equipment, on this equipment during decontamination to prevent contact with fluids generated by previous equipment decontamination. Store clean equipment in a separate location to prevent recontamination. Collect decontamination fluids contained within the bermed area and store them in secured containers as described below.

Use wash buckets or tubs to catch fluids from the decontamination of lighter-weight drilling equipment and hand-held sampling devices. Collect the decontamination fluids and store them on site in secured containers, such as U.S. Department of Transportation-approved drums, until their disposition is determined by laboratory analytical results. Label containers in accordance with Procedure 3-05, *IDW Management*.

6.0 Quality Control and Assurance

A decontamination program must incorporate quality control measures to determine the effectiveness of cleaning methods. Quality control measures typically include collection of equipment blank samples or wipe testing. Equipment blanks consist of analyte-free water that has been poured over or through the sample collection equipment after its final decontamination rinse. Wipe testing is performed by wiping a cloth over the surface of the equipment after cleaning. These quality control measures provide "after-the fact" information that may be useful in determining whether or not cleaning methods were effective in removing the contaminants of concern.

7.0 Records, Data Analysis, Calculations

Any project where sampling and analysis is performed shall be executed in accordance with an approved sampling and analysis plan. This procedure may be incorporated by reference or may be incorporated with modifications described in the plan.

Deviations from this procedure or the sampling and analysis plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

8.0 Attachments or References

8.1 ASTM Standard D5088. 2008. *Standard Practice for Decontamination of Field Equipment Used at Waste Sites.* ASTM International, West Conshohocken, PA. 2008. DOI: 10.1520/D5088-02R08. www.astm.org.

8.1 EM 200-1-6, *Chemical Quality Assurance for HTRW Projects,* October 1997.

8.2 NAVSEA T0300-AZ-PRO-010. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*. August 2009.

8.3 Procedure 3-05, *IDW Management*.

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Monitoring Well Sampling

Procedure 3-14

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes the actions to be used during monitoring well sampling activities and establishes the method for sampling groundwater monitoring wells for water-borne contaminants and general groundwater chemistry. The objective is to obtain groundwater samples that are representative of aquifer conditions with as little alteration to water chemistry as possible.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 Depending upon the site-specific contaminants, various protective programs must be implemented prior to sampling the first well. All field sampling personnel responsible for sampling activities must review the project-specific health and safety plan (HASP) paying particular attention to the control measures planned for the well sampling tasks. Conduct preliminary area monitoring of sampling wells to determine the potential hazard to field sampling personnel. If significant contamination is observed, minimize contact with potential contaminants in both the vapor phase and liquid matrix through the use of of appropriate personal protective equipment (PPE).

2.2 Observe standard health and safety practices according to the project-specific HASP. Suggested minimum protection during well sampling activities includes inner disposable vinyl gloves, outer chemical-protective nitrile gloves and rubberized steel-toed boots. Half-face respirators and cartridges and Tyvek® suits may be necessary depending on the contaminant concentrations. Refer to the project-specific HASP for the required PPE.

2.3 Physical Hazards associated with Well Sampling

- To avoid lifting injuries associated with pump and bailers retrieval, use the large muscles of the legs, not the back.
- Stay clear of all moving equipment, and avoid wearing loose fitting clothing.
- When using tools for cutting purposes, cut away from yourself. The use of appropriate, task specific cutting tools is recommended.
- To avoid slip/trip/fall conditions as a result of pump discharge, use textured boots/boot cover bottoms.
- To avoid heat/cold stress as a result of exposure to extreme temperatures and PPE, drink electrolyte replacement fluids (1 to 2 cups per hour is recommended) and, in cases of extreme cold, wear fitted insulating clothing.
- Be aware of restricted mobility due to PPE.

3.0 Terms and Definitions

None.

4.0 Interferences

4.1 Potential interferences could result from cross-contamination between samples or sample locations. Minimization of the cross-contamination will occur through the following:

- The use of clean sampling tools at each location as necessary.
- Avoidance of material that is not representative of the media to be sampled.

5.0 Training and Qualifications

5.1 **Qualifications and Training**

The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

5.2 **Responsibilities**

5.2.1 The **Project Manager** is responsible for ensuring that monitoring well sampling activities comply with this procedure. The **Project Manager** is responsible for ensuring that all field sampling personnel involved in monitoring well sampling shall have the appropriate education, experience, and training to perform their assigned tasks.

5.2.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

5.2.3 The **Field Manager** is responsible for ensuring that all field sampling personnel follow these procedures.

5.2.4 **Field sampling personnel** are responsible for the implementation of this procedure.

5.2.5 The field sampler and/or task manager is responsible for directly supervising the groundwater sampling procedures to ensure that they are conducted according to this procedure and for recording all pertinent data collected during sampling.

6.0 Equipment and Supplies

6.1 Purging and Sampling Equipment

- Pump (Peristaltic, Portable Bladder, Submersible)
- Polyethylene or Teflon bladders (for portable bladder pumps)
- Bladder pump controller (for portable bladder pumps)
- Air compressor (for portable bladder pumps)
- Nitrogen cylinders (for portable bladder pumps)
- 12-volt power source
- Polyethylene inlet and discharge tubing (except for VOC analysis which requires Teflon tubing)
- Silicone tubing appropriate for peristaltic pump head
- Teflon bailer appropriately sized for well
- Disposable bailer string (polypropylene)

- Individual or multi-parameter water quality meter(s) with flow-through cell to measure temperature, pH, specific conductance, dissolved oxygen (DO), oxidation reduction potential (ORP), and/or turbidity
- Turbidity meter
- Water level meter
- Oil/water interface probe

6.2 General Equipment

- Sample kit (i.e., bottles, labels, preservatives, custody records and tape, cooler, ice)
- Sample Chain-of-Custody (COC) forms
- Sample Collection Records
- Sample packaging and shipping supplies
- Waterproof marker or paint
- Distilled/deionized water supply
- Water dispenser bottles
- Flow measurement cup or bucket
- 5-gallon buckets
- Instrument calibration solutions
- Stopwatch or watch
- Disposable Nitrile gloves
- Paper towels
- Trash bags
- Zipper-lock bags
- Equipment decontamination supplies
- Health and safety supplies (as required by the HASP)
- Approved plans such as: project-specific HASP and Sampling and Analysis Plan (SAP)
- Well keys or combinations
- Monitoring well location map(s)
- Field project logbook/pen

7.0 Calibration or Standardization

7.1 Field instruments will be calibrated daily according to the requirements of the SAP and manufacturer’s specifications for each piece of equipment. Equipment will be checked daily with the calibration solutions at the end of use of the equipment. Calibration records shall be recorded in the field logbook or appropriate field form.

7.2 If readings are suspected to be inaccurate, the equipment shall be checked with the calibration solutions and/or re-calibrated.

8.0 Procedure

8.1 Preparation

8.1.1 Site Background Information

Establish a thorough understanding of the purposes of the sampling event prior to field activities. Conduct a review of all available data obtained from the site and pertinent to the water sampling. Review well history data including, but not limited to, well locations, sampling history, purging rates, turbidity problems, previously used purging methods, well installation methods, well completion records, well development methods, previous analytical results, presence of an immiscible phase, historical water levels, and general hydrogeologic conditions.

Previous groundwater development and sampling logs give a good indication of well purging rates and the types of problems that might be encountered during sampling, such as excessive turbidity and low well yield. They may also indicate where dedicated pumps are placed in the water column. To help minimize the potential for cross-contamination, well purging and sampling and water level measurement collection shall proceed from the least contaminated to the most contaminated well as indicated by previous analytical results. This order may be changed in the field if conditions warrant it, particularly if dedicated sampling equipment is used. A review of prior sampling procedures and results may also identify which purging and sampling techniques are appropriate for the parameters to be tested under a given set of field conditions.

8.1.2 Groundwater Analysis Selection

Establish the requisite field and laboratory analyses prior to water sampling. Decide on the types and numbers of quality assurance/quality control (QA/QC) samples to be collected (refer to the project-specific SAP), as well as the type and volume of sample preservatives, the type and number of sample containers, the number of coolers required, and the quantity of ice or other chilling materials. The field sampling personnel shall ensure that the appropriate number and size sample containers are brought to the site, including extras in case of breakage or unexpected field conditions. Refer to the project-specific SAP for the project analytical requirements.

8.2 Groundwater Sampling Procedures

Groundwater sampling procedures at a site shall include:

1) An evaluation of the well security and condition prior to sampling;
2) Decontamination of equipment;
3) Measurement of well depth to groundwater;
4) Assessment of the presence or absence of an immiscible phase;
5) Assessment of purge parameter stabilization;
6) Purging of static water within the well and well bore; and
7) Obtaining a groundwater sample.

Each step is discussed in sequence below. Depending upon specific field conditions, additional steps may be necessary. As a rule, at least 24 hours should separate well development and well sampling events. In all cases, consult the State and local regulations for the site, which may require more stringent time separation between well development and sampling.

8.2.1 Well Security and Condition

At each monitoring well location, observe the conditions of the well and surrounding area. The following information may be noted on a Groundwater Sample Collection Record (Attachment 1) or in the field logbook:

- Condition of the well's identification marker.
- Condition of the well lock and associated locking cap.
- Integrity of the well – well pad condition, protective outer casing, obstructions or kinks in the well casing, presence of water in the annular space, and the top of the interior casing.
- Condition of the general area surrounding the well.

8.2.2 Decontamination of Equipment

Where possible, dedicated supplies should be used at each well location to minimize the potential for cross-contamination and minimize the amount of investigation derived waste (IDW) fluids resulting from the decontamination process. If decontamination is necessary, establish a decontamination station before beginning sampling. The station shall consist of an area of at least 4 feet by 2 feet covered with plastic sheeting and be located upwind of the well being sampled. The station shall be large enough to fit the appropriate number of wash and rinse buckets, and have sufficient room to place equipment after decontamination. One central cleaning area may be used throughout the entire sampling event. The area around the well being sampled shall also be covered with plastic sheeting to prevent spillage. Further details are presented in SOP 3-06, Equipment Decontamination.

Decontaminate each piece of equipment prior to entering the well. Also, conduct decontamination prior to sampling at a site, even if the equipment has been decontaminated subsequent to its last usage. Additionally, decontaminate each piece of equipment used at the site prior to leaving the site. It is only necessary to decontaminate dedicated sampling equipment prior to installation within the well. Do not place clean sampling equipment directly on the ground or other contaminated surfaces prior to insertion into the well. Dedicated sampling equipment that has been certified by the manufacturer as being decontaminated can be placed in the well without on-site decontamination.

8.2.3 Measurement of Static Water Level Elevation

Before purging the well, measure water levels in all of the wells within the zone of influence of the well being purged. The best practice, if possible, is to measure all site wells (or wells within the monitoring well network) prior to sampling. If the well cap is not vented, remove the cap several minutes before measurement to allow water levels to equilibrate to atmospheric pressure.

Measure the depth to standing water and the total depth of the well to the nearest 0.01 foot to provide baseline hydrologic data, to calculate the volume of water in the well, and to provide information on the integrity of the well (e.g., identification of siltation problems). If not already present, mark an easily identified reference point for water level measurements which will become the measuring point for all water level measurements. This location and elevation must be surveyed.

The device used to measure the water level surface and depth of the well shall be sufficiently sensitive and accurate in order to obtain a measurement to the nearest 0.01 foot reliably. An electronic water level meter will usually be appropriate for this measurement; however, when the groundwater within a particular well is highly contaminated, an inexpensive weighted tape measure can be used to determine well depth to prevent adsorption of contaminants onto the meter tape. The presence of light, non-aqueous phase liquids (LNAPLs) and/or dense, non-aqueous phase liquids (DNAPLs) in a well requires measurement of the elevation of the top and the bottom of the product, generally using an interface probe. Water levels in such wells must then be corrected for density effects to accurately determine the elevation of the water table.

At each location, measure water levels several times in quick succession to ensure that the well has equilibrated to atmospheric conditions prior to recording the measurement. As stated above, measure all site wells (or wells within the monitoring well network) prior to sampling whenever possible. This will provide a water level database that describes water levels across the site at one time (a synoptic sampling). Prior to sampling, measure the water level in each well immediately prior to purging the well to ascertain that static conditions have been achieved prior to sampling.

8.2.4 Detection of Immiscible Phase Layers

Complete the following steps for detecting the presence of LNAPL and DNAPL before the well is purged for conventional sampling. These procedures may not be required for all wells. Consult the project-specific SAP to determine if assessing the presence of LNAPL and/or DNAPL is necessary.

1) Sample the headspace in the wellhead immediately after the well is opened for organic vapors using either a PID or an organic vapor analyzer, and record the measurements.
2) Lower an interface probe into the well to determine the existence of any immiscible layer(s), LNAPL and/or DNAPL, and record the measurements.
3) Confirm the presence or absence of an immiscible phase by slowly lowering a clear bailer to the appropriate depth, then visually observing the results after sample recovery.
4) In rare instances, such as when very viscous product is present, it may be necessary to utilize hydrocarbon- and water-sensitive pastes for measurement of LNAPL thickness. This is accomplished by smearing adjacent, thin layers of both hydrocarbon- and water-sensitive pastes along a steel measuring tape and inserting the tape into the well. An engineering tape showing tenths and hundredths of feet is required. Record depth to water, as shown by the mark on the water-sensitive paste, and depth to product, as shown by the mark on the product-sensitive paste. In wells where the approximate depth to water and product thickness are not known, it is best to apply both pastes to the tape over a fairly long interval (5 feet or more). Under these conditions, measurements are obtained by trial and error and may require several insertions and retrievals of the tape before the paste-covered interval of the tape encounters product and water. In wells where approximate depths of air-product and product-water interfaces are known, pastes may be applied over shorter intervals. Water depth measurements should not be used in preparation of water table contour maps until they are corrected for depression by the product.
5) If the well contains an immiscible phase, it may be desirable to sample this phase separately. Section 8.2.6 presents immiscible phase sampling procedures. It may not be meaningful to conduct water sample analysis of water obtained from a well containing LNAPLs or DNAPLs. Consult the **Project Manager** and **Program Quality Manager** if this situation is encountered.

8.2.5 Purging Equipment and Use

General Requirements

The water present in a well prior to sampling may not be representative of in situ groundwater quality and shall be removed prior to sampling. Handle all groundwater removed from potentially contaminated wells in accordance with the IDW handling procedures in SOP 3-05, IDW Management. Purging shall be accomplished by methods as indicated in the project-specific SAP or by those required by State requirements. For the purposes of this SOP, purging methods will be described by removing groundwater from the well using low-flow techniques.

According to the U.S. Environmental Protection Agency (EPA) (EPA, 1996), the rate at which groundwater is removed from the well during purging ideally should be less than 0.2 to 0.3 liters/minute. EPA further states that wells should be purged at rates below those used to develop the well to prevent further development of the well, to prevent damage to the well, and to avoid disturbing accumulated corrosion or reaction products in the well. EPA also indicates that wells should be purged at or below their recovery rate so that migration of water in the formation above the well screen does not occur.

Realistically, the purge rate should be low enough that substantial drawdown in the well does not occur during purging. In addition, a low purge rate will reduce the possibility of stripping volatile organic compounds (VOCs) from the water, and will reduce the likelihood of increasing the turbidity of the sample due to mobilizing colloids in the subsurface that are immobile under natural flow conditions.

The field sampler shall ensure that purging does not cause formation water to cascade down the sides of the well screen. Wells should not be purged to dryness if recharge causes the formation water to cascade down the sides of the screen, as this will cause an accelerated loss of volatiles. This problem should be anticipated based on the results of either the well development task or historical sampling events. In general, place the intake of the purge pump in the middle of the saturated screened interval within the well to allow purging and at the same time minimize disturbance/overdevelopment of the screened interval in the well. Water shall be purged from the well at a rate that does not cause recharge water to be excessively agitated unless an extremely slow recharging well is encountered where complete evacuation is unavoidable. During the well purging procedure, collect water level and/or product level measurements to assess the hydraulic effects of purging. Sample the well when it recovers sufficiently to provide enough water for the analytical parameters specified. If the well is purged dry, allow the well to recover sufficiently to provide enough water for the specified analytical parameters, and then sample it.

Evaluate water samples on a regular basis during well purging and analyze them in the field preferably using in-line devices (i.e., flow through cell) for temperature, pH, specific conductivity, dissolved oxygen (DO), and oxidation-reduction (redox) potential. Turbidity should be measured separately (outside of the flow-through cell) with a nephelometer or similar device.

Readings should be taken every 2 to 5 minutes during the purging process. These parameters are measured to demonstrate that the natural character of the formation waters has been restored.

Purging shall be considered complete per the requirements set forth in the project-specific SAP, State requirements, or when three consecutive field parameter measurements of temperature, pH, specific conductivity, DO and ORP stabilize within approximately 10 percent and the turbidity is at or below 10 nephelometric turbidity units (NTU) or within ± 10% if above 10 NTU. This criterion may not be applicable to temperature if a submersible pump is used during purging due to the heating of the water by the pump motor. Enter all information obtained during the purging and sampling process into a groundwater sampling log. Attachment 1 shows an example of a groundwater sampling log and the information typically included in the form. Whatever form is used, all blanks need to be completed on the field log during field sampling.

Groundwater removed during purging shall be stored according to the project-specific SAP or per SOP 3-05, IDW Management.

Purging Equipment and Methods

Submersible Pump

A stainless steel submersible pump may be utilized for purging both shallow and deep wells prior to sampling the groundwater for semivolatile and non-volatile constituents, but are generally not preferred for VOCs unless there are no other options (e.g., well over 200 feet deep). For wells over 200 feet deep, the submersible pump is one of the few technologies available to feasibly accomplish purging under any yield conditions. For shallow wells with low yields, submersible pumps are generally inappropriate due to overpumpage of the wells (<1 gallon per minute), which causes increased aeration of the water within the well.

Steam clean or otherwise decontaminate the pump and discharge tubing prior to placing the pump in the well. The submersible pump shall be equipped with an anti-backflow check valve to limit the amount of water that will flow back down the drop pipe into the well. Place the pump in the middle of the saturated screened interval within the well and maintain it in that position during purging.

Bladder Pump

A stainless steel bladder pump can be utilized for purging and sampling wells up to 200 feet in depth for volatile, semivolatile, and non-volatile constituents. Use of the bladder pump is most effective in low to moderate yield wells and are often the preferred method for low-flow sampling. When sampling for VOCs and/or SVOCs, Teflon bladders should be used. Polyethylene bladders may be used when sampling for inorganics.

Either compressed dry nitrogen or compressed dry air, depending upon availability, can operate the bladder pump. The driving gas utilized must be dry to avoid damage to the bladder pump control box. Decontaminate the bladder pump prior to use.

Centrifugal, Peristaltic, or Diaphragm Pump

A centrifugal, peristaltic, or diaphragm pump may be utilized to purge a well if the water level is within 20 feet of ground surface. New or dedicated tubing is inserted into the midpoint of the saturated screened interval of the well. Water should be purged at a rate that satisfies low-flow requirements (i.e., does not cause drawdown). Centrifugal, peristaltic, or diaphragm pump are generally discouraged for VOCs sampling; however, follow methods allowed per the project-specific SAP or State requirements.

Air Lift Pump

Airlift pumps are not appropriate for purging or sampling.

Bailer

Avoid using a bailer to purge a well because it can result in overdevelopment of the well and create excessive purge rates. If a bailer must be used, the bailer should either be dedicated or disposable. Teflon-coated cable mounted on a reel is recommended for lowering the bailer in and out of the well.

Lower the bailer below the water level of the well with as little disturbance of the water as possible to minimize aeration of the water in the well. One way to gauge the depth of water on the reel is to mark the depth to water on the bailer wire with a stainless steel clip. In this manner, less time is spent trying to identify the water level in the well.

8.2.6 Monitoring Well Sampling Methodologies

Sampling Light, Non-Aqueous Phase Liquids (LNAPL)

Collect LNAPL, if present, prior to any purging activities. The sampling device shall generally consist of a dedicated or disposable bailer equipped with a bottom-discharging device. Lower the bailer slowly until contact is made with the surface of the LNAPL, and to a depth less than that of the immiscible fluid/water interface depth as determined by measurement with the interface probe. Allow the bailer to fill with LNAPL and retrieve it.

When sampling LNAPLs, never drop bailers into a well and always remove them from the well in a manner that causes as little agitation of the sample as possible. For example, the bailer should not be removed in a jerky fashion or be allowed to continually bang against the well casing as it is raised. Teflon bailers should always be used when sampling LNAPL. The cable used to raise and lower the bailer shall be composed of an inert material (e.g., stainless steel) or coated with an inert material (e.g., Teflon).

Sampling Dense, Non-Aqueous Phase Liquids (DNAPL)

Collect DNAPL prior to any purging activities. The best method for collecting DNAPL is to use a double-check valve, stainless steel bailer, or a Kemmerer (discrete interval) sampler. The sample shall be collected by slow, controlled lowering of the bailer to the bottom of the well, activation of the closing device, and retrieval.

Groundwater Sampling Methodology

The well shall be sampled when groundwater within it is representative of aquifer conditions per the methods described in Section 8.2.5. Prior to sampling the flow-through cell shall be removed and the samples collected directly from the purge tubing. Flow rates shall not be adjusted once aquifer conditions are met. Additionally, a period of no more than 2 hours shall elapse between purging and sampling to prevent groundwater interaction with the casing and atmosphere. This may not be possible with a slowly recharging well. Measure and record the water level prior to sampling in order to monitor drawdown when using low-flow techniques and gauge well volumes removed and recharged when using non-low-flow techniques.

Sampling equipment (e.g., especially bailers) shall never be dropped into the well, as this could cause aeration of the water upon impact. Additionally, the sampling methodology utilized shall allow for the collection of a groundwater sample in as undisturbed a condition as possible, minimizing the potential for volatilization or aeration. This includes minimizing agitation and aeration during transfer to sample containers, minimizing exposure to sunlight, and immediately placing the sample on ice once collected.

Sampling equipment shall be constructed of inert material. Equipment with neoprene fittings, polyvinyl chloride (PVC) bailers, Tygon® tubing, silicon rubber bladders, neoprene impellers, polyethylene, and Viton® are not acceptable when sampling for organics. If bailers are used, an inert cable/chain (e.g., fluorocarbon resin-coated wire or stainless steel wire or cable) shall be used to raise and lower the bailer. Dedicated equipment is highly recommended for all sampling programs.

Submersible Pumps

The submersible pump must be specifically designed for groundwater sampling (i.e., pump composed of stainless steel and Teflon, sample discharge lines composed of Teflon) and must have a controller mechanism allowing the required low-flow rate. Adjust the pump rate so that flow is continuous and does not pulsate to avoid aeration and agitation within the sample discharge lines. Run the pump for several minutes at the low-flow rate used for sampling to ensure that the groundwater in the lines was obtained at the low-flow rate.

Bladder Pumps

A gas-operated stainless steel bladder pump with adjustable flow control and equipped with a Teflon bladder and Teflon-lined tubing can be effectively utilized to collect a groundwater sample and is considered to be the best overall device for sampling inorganic and organic constituents. If only inorganics are being sampled, polyvinyl bladders and tubing may be used. Operate positive gas displacement bladder pumps in a continuous manner so that they minimize discharge pulsation that can aerate samples in the return tube or upon discharge.

When using a compressor, take several precautions. If the compressor is being powered by a gasoline generator, position the generator downwind of the well. Ground fault circuit interrupters (GFCIs) should always be used when using electric powered equipment. Do not connect the compression hose from the compressor to the pump controller until after the engine has been started.

When all precautions are completed and the compressor has been started, connect the compression hose to the pump controller. Slowly adjust the control knobs to discharge water in the shortest amount of time while maintaining a near constant flow. This does not mean that the compressor must be set to discharge the water as hard as possible. The optimal setting is one that produces the largest volume of purge water per minute (not per purge cycle) while maintaining a near constant flow rate.

Prior to sampling, adjust the flow rate (purge rate) to yield 100 to 300 mL/minute. Avoid settings that produce pulsating streams of water instead of a steady stream if possible. Operate the pump at this low flow rate for several minutes to ensure that drawdown is not occurring. At no time shall the sample flow rate exceed the flow rate used while purging.

For those samples requiring filtration, it is recommended to use an in-line high capacity filter after all non-filtered samples have been collected.

***Peristaltic Pumps*:**

A peristaltic pump is a type of positive displacement pump that moves water via the process of peristalsis. The pump uses a flexible hose fitted inside a circular pump casing. A rotor with cams compresses the flexible tube as the rotor turns, which forces the water to be pumped to move through the tube. In peristaltic pumps, no moving parts of the pump are in contact with the water being pumped. Displacement is determined by tube size, so delivery rate can only be changed during operation by varying pump speed. Peristaltic pumps are simple and quite inexpensive for the flow rates they provide.

There are several methods available for transferring the sample into the laboratory containers. The selected method may vary based on State requirements and should be documented in the project-specific SAP. Samples typically can be collected directly from the discharge end of the Teflon tubing, after it has been disconnected from the flow through cell. For volatile analyses, the sampler should make sure that the pump is set such that a smooth laminar flow is achieved. In all cases, the project team should consult their local regulatory requirements and document the selected sample collection procedure in the project-specific SAP.

Bailers

A single- or double-check valve Teflon or stainless steel bailer equipped with a bottom discharging device can be utilized to collect groundwater samples. Bailers have a number of disadvantages, however, including a tendency to alter the chemistry of groundwater samples due to degassing, volatilization, and aeration; the possibility of creating high groundwater entrance velocities; differences in operator techniques resulting in variable samples; and difficulty in determining where in the water column the sample was collected. Therefore, use bailers for groundwater sampling only when other types of sampling devices cannot be utilized for technical, regulatory, or logistical reasons.

Dedicated or disposable bailers should always be used in order to eliminate the need for decontamination and to limit the potential of cross-contamination. Each time the bailer is lowered to the water table, lower it in such a way as to minimize disturbance and aeration of the water column within the well.

8.2.7 **Sample Handling and Preservation**

Many of the chemical constituents and physiochemical parameters to be measured or evaluated during groundwater monitoring programs are chemically unstable and require preservation. The U.S. EPA document entitled, *Test Methods for Evaluating Solid Waste – Physical/Chemical Methods (SW-846)* (EPA 1997), includes a discussion of appropriate sample preservation procedures. In addition, SW-846 provides guidance on the types of sample containers to use for each constituent or common set of parameters. In general, check with specific laboratory or State requirements prior to obtaining field samples. In many cases, the laboratory will supply the necessary sample bottles and required preservatives. In some cases, the field sampling personnel may add preservatives in the field.

Improper sample handling may alter the analytical results of the sample. Therefore, transfer samples in the field from the sampling equipment directly into the container that has been prepared specifically for that analysis or set of compatible parameters as described in the project-specific SAP. It is not an acceptable practice for samples to be composited in a common container in the field and then split in the laboratory, or poured first into a wide mouth container and then transferred into smaller containers.

Collect groundwater samples and place them in their proper containers in the order of decreasing volatility and increasing stability. A preferred collection order for some common groundwater parameters is:

1. VOCs and total organic halogens (TOX)
2. Dissolved gases, total organic carbon (TOC), total fuel hydrocarbons
3. Semivolatile organics, pesticides
4. Total metals, general minerals (unfiltered)
5. Dissolved metals, general minerals (filtered)
6. Phenols
7. Cyanide
8. Sulfate and chloride
9. Nitrate and ammonia
10. Radionuclides

When sampling for VOCs, collect water samples in vials or containers specifically designed to prevent loss of VOCs from the sample. The analytical laboratory performing the analysis shall provide these vials. Collect groundwater from the sampling device in vials by allowing the groundwater to slowly flow along the sides of the vial. Sampling equipment shall not touch the interior of the vial. Fill the vial above the top of the vial to form a positive meniscus with no overflow. No headspace shall be present in the sample container once the container has been capped. This can be checked by inverting the bottle once the sample is collected and tapping the side of the vial to dislodge air bubbles. Sometimes it is not possible to collect a sample without air bubbles, particularly water that has high concentrations of dissolved gasses. In these cases, the field sampling personnel shall document the occurrence in the field logbook and/or sampling worksheet at the time the sample was collected. Likewise, the analytical laboratory shall note in the laboratory analysis reports any headspace in the sample container(s) at the time of receipt by the laboratory.

Special Handling Considerations

In general, samples for organic analyses should not be filtered. However, high turbidity samples for PCB analysis may require filtering. Consult the project-specific SAP for details on filtering requirements. Samples shall not be transferred from one container to another because this could cause aeration or a loss of organic material onto the walls of the container. TOX and TOC samples should be handled in the same manner as VOC samples.

When collecting total and dissolved metals samples, the samples should be collected sequentially. The total metals sample is collected from the pump unfiltered. The dissolved metals sample is collected after filtering with a 0.45-micron membrane in-line filter. Allow at least 500 mL of effluent to flow through the filter prior to sampling to ensure that the filter is thoroughly wetted and seated in the filter capsule. If required by the project-specific SAP, include a filter blank for each lot of filters used and always record the lot number of the filters.

Field Sampling Preservation

Preserve samples immediately upon collection. Ideally, sampling containers will be pre-preserved with a known concentration and volume of preservative. Certain matrices that have alkaline pH (greater than 7) may require more preservative than is typically required. An early assessment of preservation techniques, such as the use of pH strips after initial preservation, may therefore be appropriate. Guidance for the preservation of environmental samples can be found in the U.S. EPA *Handbook for Sampling and Sample Preservation of Water and Wastewater* (EPA 1982). Additional guidance can be found in other U.S. EPA documents (EPA 1992, 1996).

Field Sampling Log

A groundwater sampling log provided as Attachment 1 shall document the following:

- Identification of well
- Well depth
- Static water level depth and measurement technique
- Presence of immiscible layers and detection method
- Well yield
- Purge volume and pumping rate
- Time that the well was purged
- Sample identification numbers
- Well evacuation procedure/equipment
- Sample withdrawal procedure/equipment
- Date and time of collection
- Types of sample containers used
- Preservative(s) used
- Parameters requested for analysis

- Field analysis data
- Field observations on sampling event
- Name of sampler
- Weather conditions

9.0 Quality Control and Assurance

9.1 Field personnel will follow specific quality assurance (QA) guidelines as outlined in the project-specific SAP. The goal of the QA program should be to ensure precision, accuracy, representativeness, completeness, and comparability in the project sampling program.

9.2 Quality control (QC) requirements for sample collection are dependent on project-specific sampling objectives. The project-specific SAP will provide requirements for sample preservation and holding times, container types, sample packaging and shipment, as well as requirements for the collection of various QC samples such as trip blanks, field blanks, equipment rinse blanks, and field duplicate samples.

10.0 Data and records management

10.1 Records will be maintained in accordance with SOP 3-03, Recordkeeping, Sample Labelling, and Chain-of-Custody. Various forms are required to ensure that adequate documentation is made of the sample collection activities. These forms may include:

- Sample Collection Records;
- Field logbook;
- Chain-of-custody forms; and
- Shipping labels.

10.2 Sample collection records (Attachment 1) will provide descriptive information for the purging process and the samples collected at each monitoring well.

10.3 The field logbook is kept as a general log of activities and should not be used in place of the sample collection record.

10.4 Chain-of-custody forms are transmitted with the samples to the laboratory for sample tracking purposes.

10.5 Shipping labels are required is sample coolers are to be transported to a laboratory by a third party (courier service).

11.0 Attachments or References

Attachment 1 – Groundwater Sampling Collection Record

ASTM Standard D5088. 2008. *Standard Practice for Decontamination of Field Equipment Used at Waste Sites.* ASTM International, West Conshohocken, PA. 2008. DOI: 10.1520/D5088-02R08. www.astm.org.

Environmental Protection Agency, United States (EPA). 1982. *Handbook for Sampling and Sample Preservation of Water and Wastewater.* EPA-600/4-82-029. Cincinnati: EPA Office of Research and Development, Environmental Monitoring and Support Laboratory.

EPA. 1992. *RCRA Groundwater Monitoring Draft Technical Guidance*. EPA/530/R-93/001. Office of Solid Waste. November.

EPA. 1996. *Ground Water Issue: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*. EPA/540/S-95/504. Office of Solid Waste and Emergency Response. April.

EPA. 1997. *Test Methods for Evaluating Solid Waste, Physical/Chemical Method (SW-846)*. 3rd ed., Final Update IIIA. Office of Solid Waste. Online updates at: http://www.epa.gov/epaoswer/hazwaste/test/new-meth.htm.

NAVSEA T0300-AZ-PRO-010. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*. August 2009.

SOP 3-03, *Recordkeeping, Sample Labelling, and Chain-of-Custody*.

SOP 3-05, *IDW Management.*

SOP 3-06, *Equipment Decontamination*.

AECOM

Attachment 1
Groundwater Sample Collection Record

Well ID:

Groundwater Sample Collection Record

Client: ______ Date: ______ Time: Start ______ am/pm
Project No: ______ Finish ______ am/pm
Site Location: ______
Weather Conds: ______ Collector(s): ______

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length ______ c. Length of Water Column ______ (a-b) Casing Diameter/Material ______

b. Water Table Depth ______ d. Calculated Well Volume (see back) ______

2. WELL PURGEABLE DATA

a. Purge Method: ______

b. Acceptance Criteria defined (see SAP or Work Plan)
- Minimum Required Purge Volume (@ ______ well volumes) ______
- Maximum Allowable Turbidity ______ NTUs
- Stabilization of parameters ______ %

c. Field Testing Equipment used: Make Model Serial Number

Make	Model	Serial Number

Time (min)	Volume Removed (gal)	Temp. (°C)	pH s.u.	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (m)	Color/Odor/etc.

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☐	☐	☐

(continued on back)

If no or N/A - Explain below.

______

3. SAMPLE COLLECTION: Method: ______

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time

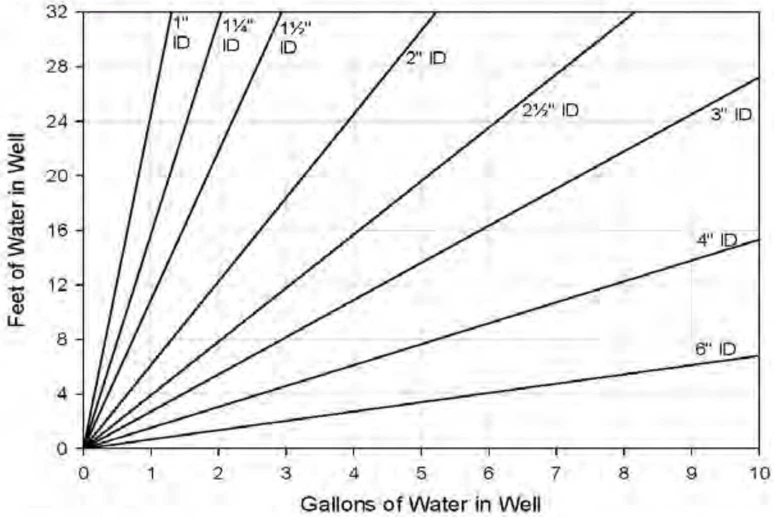
Comments ______

Signature ______ Date ______

Page 1 of 2

Purge Volume Computation

Well ID:



Volume / Linear Ft. of Pipe		
ID (in)	**Gallon**	**Liter**
¼	0.0025	0.0097
⅜	0.0057	0.0217
½	0.0102	0.0386
¾	0.0229	0.0869
1	0.0408	0.1544
1¼	0.0637	0.2413
1½	0.0918	0.3475
2	0.1632	0.6178
2½	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (min)	Volume Removed (gal)	Temp. (°C)	pH s.u.	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (m)	Color/Odor/etc.

Signature ______________________________ Date ______________

Operation and Calibration of a Photoionization Detector

Procedure 3-20

1.0 Purpose and Scope

1.1 Purpose and Applicability

1.1.1 This standard operating procedure (SOP) describes the procedures that will be followed by field staff for operation and calibration of a photoionization detector (PID). The PID is primarily used by AECOM personnel for safety and survey monitoring of ambient air, determining the presence of volatiles in soil and water, and detecting leakage of volatiles.

1.1.2 PIDs routinely used by field personnel include the Photovac Microtip, Thermoelectron 580EZ, and MiniRAE 2000. Personnel responsible for using the PID should first read and thoroughly familiarize themselves with the instrument instruction manual.

1.2 Principle of Operation

1.2.1 The PID is a non-specific vapor/gas detector. The unit generally consists of a hand-held probe that houses a PID, consisting of an ultraviolet (UV) lamp, two electrodes, and a small fan which pulls ambient air into the probe inlet tube. The probe is connected to a readout/control box that consists of electronic control circuits, a readout display, and the system battery. Units are available with UV lamps having an energy from 9.5 electron volts (eV) to 11.7 eV.

1.2.2 The PID analyzer measures the concentration of trace gas present in the atmosphere by photoionization. Photoionization occurs when an atom or molecule absorbs a photon of sufficient energy to release an electron and become a positive ion. This will occur when the ionization potential of the molecule (in electron volts (eV)) is less than the energy of the photon. The source of photons is an ultraviolet lamp in the probe unit. Lamps are available with energies ranging from 9.5 eV to 11.7 eV. All organic and inorganic vapor/gas compounds having ionization potentials lower than the energy output of the UV lamp are ionized and the resulting potentiometric change is seen as a positive reading on the unit. The reading is proportional to the concentration of organics and/or inorganics in the vapor.

1.2.3 Sample gases enter the probe through the inlet tube and enter the ion chamber where they are exposed to the photons emanating from the UV lamp. Ionization occurs for those molecules having ionization potentials near to or less than that of the lamp. A positive- biased polarizing electrode causes these positive ions to travel to a collector electrode in the chamber. Thus the ions create an electrical current which is amplified and displayed on the meter. This current is proportional to the concentration of trace gas present in the ion chamber and to the sensitivity of that gas to photoionization.

1.2.4 In service, the analyzer is first calibrated with a gas of known composition equal to, close to, or representative of that to be measured. Gases with ionization potentials near to or less than the energy of the lamp will be ionized. These gases will thus be detected and measured by the analyzer. Gases with ionization potentials greater than the energy of the lamp will not be detected. The ionization potentials of the major components of air, i.e., oxygen, nitrogen, and carbon dioxide, range from about 12.0 eV to 15.6 eV and are not ionized by any of the lamps available. Gases with ionization potentials near to or slightly higher than the lamp are partially ionized, with low sensitivity.

1.3 Specifications

1.3.1 Refer to the manufacturer's instructions for the technical specifications of the instrument being used. The operating concentration range is typically 0.1 to 2,000 ppm isobutylene equivalent.

2.0 Safety

2.1 The health and safety considerations for the work associated with this SOP, including both potential physical and chemical hazards, will be addressed in the project Health and Safety Plan (HASP). In the absence of a HASP, work will be conducted according to the Contract Task Order (CTO) Work Plan (WP) and/or direction from the **Site Safety Officer (SSO)**.

2.2 Only PIDs stamped Division I Class I may be used in explosive atmospheres. Refer to the project HASP for instructions pertaining to instrument use in explosive atmospheres.

3.0 Terms and Definitions

None.

4.0 Interferences

4.1 Regardless of which gas is used for calibration, the instrument will respond to all analytes present in the sample that can be detected by the type of lamp used in the PID.

4.2 Moisture will generate a positive interference in the concentration measured for a PID and is characterized by a slow increase in the reading as the measurement is made. Care must be taken to minimize uptake of moisture to the extent possible. Refer to the manufacturers' instructions for care, cleaning, and maintenance.

4.3 Uptake of soil into the PID must be avoided as it will compromise instrument performance by blocking the probe, causing a positive interference, or dirtying the PID lamp. Refer to the manufacturers' instructions for care, cleaning, and maintenance.

4.4 The user should listen to the pitch of the sampling pump. Any changes in pitch may indicate a blockage and corrective action should be initiated.

5.0 Training and Qualifications

5.1 Qualifications and Training

The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

5.2 Responsibilities

5.2.1 The CTO Manager is responsible for ensuring that the operation and calibration activities comply with this procedure. The CTO Manager is responsible for ensuring that all personnel involved in the operation and calibration shall have the appropriate education, experience, and training to perform their assigned tasks.

5.2.2 The Program Quality Manager is responsible for ensuring overall compliance with this procedure.

5.2.3 The Field Manager is responsible for ensuring that all operation and calibration activities are conducted according to this procedure.

5.2.4 All Field Personnel are responsible for the implementation of this procedure.

6.0 Equipment and Supplies

- Calibration Gas: Compressed gas cylinder of isobutylene in air or similar stable gas mixture of known concentration. The selected gas should have an ionization potential similar to that of the vapors to be monitored, if known. The concentration should be at 50-75% of the range in which the instrument is to be calibrated;
- Regulator for calibration gas cylinder;
- Approximately 6 inches of Teflon® tubing;
- Tedlar bag (optional);
- Commercially-supplied zero grade air (optional);
- "Magic Marker" or “Sharpie” or other waterproof marker;
- Battery charger;
- Moisture traps;
- Spare lamps;
- Manufacturer’s instructions; and
- Field data sheets or logbook/pen.

7.0 Procedure

7.1 Preliminary Steps

7.1.1 Preliminary steps (battery charging, check-out, calibration, maintenance) should be conducted in a controlled or non-hazardous environment.

7.2 Calibration

7.2.1 The PID must be calibrated in order to display concentrations in units equivalent to ppm. First a supply of zero air (ambient air or from a supplied source), containing no ionizable gases or vapors is used to set the zero point. A span gas, containing a known concentration of a photoionizable gas or vapor, is then used to set the sensitivity.

7.2.2 Calibrate the instrument according to the manufacturer’s instructions. Record the instrument model and identification number, the initial and adjusted meter readings, the calibration gas composition and concentration, and the date and the time in the field records.

7.2.3 If the calibration cannot be achieved or if the span setting resulting from calibration is 0.0, then the lamp must be cleaned (Section 7.4).

7.3 Operation

7.3.1 Turn on the unit and allow it to warm up (minimum of 5 minutes). Check to see if the intake fan is functioning; if so, the probe will vibrate slightly and a distinct sound will be audible when holding the probe casing next to the ear. Also, verify on the readout display that the UV lamp is lit.

7.3.2 Calibrate the instrument as described in Section 7.2, following the manufacturer’s instructions. Record the calibration information in the field records.

7.3.3 The instrument is now operational. Readings should be recorded in the field records.

7.3.4 When the PID is not being used or between monitoring intervals, the unit may be switched off to conserve battery power and UV lamp life; however, a “bump” test should be performed each time the unit is turned on and prior to taking additional measurements. To perform a bump test, connect the outlet tubing from a Tedlar bag containing a small amount of span gas to the inlet tubing on the unit and record the reading. If the reading is not within the tolerance specified in the project plan, the unit must be recalibrated.

7.3.5 At the end of each day, recheck the calibration. The check will follow the same procedures as the initial calibration (Section 7.2) except that no adjustment will be made to the instrument. Record the information in the field records.

7.3.6 Recharge the battery after each use (Section 7.4).

7.3.7 When transporting, ensure that the instrument is packed in its stored condition in order to prevent damage.

7.4 Routine Maintenance

7.4.1 Routine maintenance associated with the use of the PID includes charging the battery, cleaning the lamp window, replacing the detector UV lamp, replacing the inlet filter, and replacing the sample pump. Refer to the manufacturer's instructions for procedures and frequency.

7.4.2 All routine maintenance should be performed in a non-hazardous environment.

7.5 Troubleshooting Tips

7.5.1 One convenient method for periodically confirming instrument response is to hold the sensor probe next to the tip of a magic marker. A significant reading should readily be observed.

7.5.2 Air currents or drafts in the vicinity of the probe tip may cause fluctuations in readings.

7.5.3 A fogged or dirty lamp, due to operation in a humid or dusty environment, may cause erratic or fluctuating readings. The PID should never be operated without the moisture trap in place.

7.5.4 Moving the instrument from a cool or air-conditioned area to a warmer area may cause moisture to condense on the UV lamp and produce unstable readings.

7.5.5 A zero reading on the meter should not necessarily be interpreted as an absence of air contaminants. The detection capabilities of the PID are limited to those compounds that will be ionized by the particular probe used.

7.5.6 Many volatile compounds have a low odor threshold. A lack of meter response in the presence of odors does not necessarily indicate instrument failure.

7.5.7 When high vapor concentrations enter the ionization chamber in the PID the unit can become saturated or "flooded". Remove the unit to a fresh air environment to allow the vapors to be completely ionized and purged from the unit.

8.0 Quality Control and Assurance

8.1 The end use of the data will determine the quality assurance requirements that are necessary to produce data of acceptable quality. These quality assurance requirements will be defined in the site-specific workplan or Sampling and Analysis Plan (SAP), hereafter referred to as the project plan.

8.2 Calibration of the PID will be conducted at the frequency specified in the project plan. In the absence of project-specific guidance, calibration will be performed at the beginning of each day of sampling and will be checked at the end of the sampling day or whenever instrument operation is suspect. The PID will sample a calibration gas of known concentration. The instrument must agree with the calibration gas within ±10%. If the instrument responds outside this tolerance, it must be recalibrated.

8.3 Checks of the instrument response (Section 7.5) should be conducted periodically and documented in the field records.

9.0 Records, Data Analysis, Calculations

Safety and survey monitoring with the PID will be documented in a bound field logbook, or on standardized forms, and retained in the project files. The following information is to be recorded:

- Project name and number;
- Instrument manufacturer, model, and identification number;
- Operator's signature;
- Date and time of operation;
- Calibration gas used;
- Calibration check at beginning and end of day (meter readings before adjustment);
- Span setting after calibration adjustment;
- Meter readings (monitoring data obtained);
- Instances of erratic or questionable meter readings and corrective actions taken; and
- Instrument checks and response verifications – e.g., battery check, magic marker response (Section 7.5) or similar test.

10.0 Attachments or References

United States Environmental Protection Agency. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM). USEPA, Region 4, SESD, Enforcement and Investigations Branch, Athens, GA. November 2001.

Author	Reviewer	Revisions (Technical or Editorial)
Robert Shoemaker Senior Scientist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue (May 2012)

AECOM

Water Quality Parameter Testing for Groundwater Sampling

Procedure 3-24

1.0 PURPOSE

This standard operating procedure (SOP) represents minimum standard of practice. State and federal requirements may vary, and this SOP does not replace state and federal requirements that must be consulted before work begins. Further, if a project-specific work plan has been created, the work plan should be considered the ruling document. This SOP may be modified to meet specific regulatory, client, or project specific criteria.

If there are procedures whether it be from AECOM, state and/or federal that are not addressed in this SOP and are applicable to water quality parameter testing, then those procedures may be added as an appendix to the project-specific Sampling and Analysis Plan (SAP).

2.0 SCOPE

This procedure provides guidance for expected sampling methods and protocols by all personnel related to the measurement of water quality parameters.

Field measurements of water quality parameters are commonly performed to evaluate surface water and groundwater. These tests are often performed to evaluate basic water quality parameters, to evaluate natural attenuation parameters, and to assess the presence of pore water entering a well.

As professional guidance for specific activities, this procedure is not intended to obviate the need for professional judgment during unforeseen circumstances. Deviations from this procedure while planning or executing planned activities must be approved by either the Project Manager or the Quality Assurance (QA) Manager, and documented.

3.0 DEFINITIONS

3.1 Barometric Pressure (BP)

The density of the atmosphere, which varies according to altitude and weather conditions.

3.2 Conductivity/Specific Conductance

A measure of the ability of water to pass electrical current, which increases with the amount of dissolved ionic substances (i.e., salts). Conductivity is inversely related to the resistance of a solution and is measured in units of mhos per centimeter (mhos/cm) (inverse ohms/cm, Siemens/cm). The conductivity of water increases with increasing temperature.

Specific Conductance is corrected for 25 degrees Celsius (°C); for this reason, it is best to record Specific Conductance. If Conductivity is recorded, the temperature of the sample MUST recorded.

3.3 Dissolved Oxygen (DO)

The amount of oxygen present in water and available for respiration. DO is typically measured in milligrams per liter (mg/L). Oxygen is less soluble in warm and salty waters, so the instrument compensates the apparent percent saturation for changes in temperature and conductivity. Most probes measure the current resulting from the electrochemical reduction of oxygen (at a gold cathode) diffusing through a selective membrane. Because oxygen is being removed from the sample to perform the measurement, sample flow is required to prevent false low readings due to depletion of oxygen in the solution in front of the probe. Optical DO probes do not remove oxygen from the sample and are less affected by salts. The common range of DO in groundwater is 0.0 to 3.0 mg/L. Measurements outside of this range suggest that the meter may not be operating correctly.

3.4 Nephelometric Turbidity Unit (NTU)

The measurement of light passing through a sample based on the scattering of light caused by suspended particles.

3.5 pH

A measure of acidity and alkalinity of a solution using a logarithmic scale on which a value of 7 represents neutrality, lower numbers indicate increasing acidity, and higher numbers are increasingly basic.

3.6 Oxidation-Reduction Potential (ORP)

Also known as redox or eH, ORP is a measurement of the potential for a reaction to occur, which generally indicates the oxygen status of a sample. The probe consists of a platinum electrode, the potential of which is measured with respect to a reference electrode that rapidly equilibrates with the potential of the sample solution. A positive value indicates that oxygen is present. A negative value indicates an anaerobic environment or reducing condition. For this reason, negative ORP readings should be associated with DO readings of less than 0.5 mg/l; with negative ORP readings the water may exhibit a sulfur odor or gray color. Positive ORP readings should be associated with DO readings greater than 0.5 mg/L and lack of sulfur odors. Because of the complex relationship between ORP and temperature, no compensation is attempted; it is thus best to report both the ORP and temperature of a water sample.

3.7 Total Dissolved Solids

A measure of the quantity of materials in water that are either dissolved or too small to be filtered.

3.8 Turbidity

Measure of the clarity of water in NTUs. Potable water typically has NTU values between 0.0 and 0.3 NTUs, depending on the state or regulatory program.

AECOM

4.0 RESPONSIBILITIES

The Project Manager, or designee, is responsible for ensuring that these standard groundwater sampling activities are followed and shall review all groundwater sampling forms at the conclusion of a sampling event. The Project Manager is responsible for ensuring that all personnel involved in monitoring well sampling shall have the appropriate education, experience, and training to perform their assigned tasks. The QA Manager or Technical Director is responsible for ensuring overall compliance with this procedure. The Field Manager is responsible for ensuring that all project field staff follows these procedures.

Field sampling personnel are responsible for the implementation of this procedure. Personnel are required to be knowledgeable of the procedures in this SOP. Training and familiarization with this SOP shall be documented in the training file for each employee. The field sampler and/or Field Manager is responsible for directly supervising the calibration procedures to ensure that they are conducted according to this procedure, and for recording all pertinent data. If deviations from the procedure are required because of anomalous field conditions, they must first be approved by the Project Manager, QA Manager, or Technical Director and then documented in the field logbook and associated report or equivalent document.

5.0 PROCEDURES

5.1 Purpose

The procedures will vary depending on parameters being measured, method of sampling, and the method of measurement used. The information here is a general guidance and the site-specific documents and manufacturer manuals supersede these procedures.

5.2 Cautions

Improper use of water quality testing equipment could result in equipment damage or compromised sampling results. Personnel should be trained to operate the test equipment being used for a field operation and should be trained in the proper techniques for collecting and logging water quality parameters. Personnel should also be able to recognize problems with test equipment and have someone available for basic troubleshooting and repair.

5.3 Interferences

During field testing, water quality data that is documented from field testing equipment may be influenced by certain outside factors that are unrelated to the actual site water quality. Such parameters and equipment include the following:

pH Meters

- Coatings of oils, greases, and particles may impair the electrode's response. Pat the electrode bulb dry with lint-free paper or cloth and rinse with de-ionized water. For cleaning hard-to-remove films, use isopropyl alcohol very sparingly so that the electronic surface is not damaged.
- Poorly buffered solutions with low specific conductance (less than 200 microsiemens per centimeter) may cause fluctuations in the pH readings. Equilibrate electrode by immersing in several aliquots of sample before taking pH.

Dissolved Oxygen

- Dissolved gases (e.g., hydrogen sulfide, halogens, sulfur dioxide) are a factor with the performance of DO probes. The effect is less pronounced on optical DO meters. Meter type and potential interferences should be considered based on potential sulfate/sulfide or nitrate/nitrite reducing environments.
- Exposure of the sample to the atmosphere will cause elevated DO measurements.

Turbidity Meter

- If the weather is warm and humidity is high, condensation may collect on the cuvet. To avoid this, allow the sample to warm and dry the outside of the cuvet before making the measurement. One method used to accomplish this is to place the cuvet against one's body (armpits work well).

Temperature

- Sample temperature will change rapidly when there are significant differences between the sample and ambient air.

5.4 Apparatus and Materials

Field personnel shall consult the site work plan and SAP to review the equipment requirements for the sampling procedures to be followed during the sampling effort. The specific apparatus and materials required will depend on the water quality parameters being monitored. Table 1 shows the common equipment used in water quality parameter testing.

Table 1
Water Quality Parameter Testing — Common Equipment

Water Quality Parameter Instrument	Calibration Standards Required	Other Equipment
pH Meter	Yes - 2 or 3 Point Standards depending on groundwater range. Calibration must cover the range to be measured. If samples are above or below typical buffer standards (4, 7 and 10), special order buffers that fall outside groundwater pH range.	Container or flow thru cell for holding sample
Specific Conductance	Yes	Container or flow thru cell for holding sample
ORP Meter	Yes	Container or flow thru cell for holding sample
Turbidity Meter	Yes	Container or flow thru cell for holding sample
DO	No	Container or flow thru cell for holding sample
Thermometer	No	Container or flow thru cell for holding sample
Flow Rate	No	Calibrated Container

Notes:
ORP = Oxidation-Reduction Potential
DO = Dissolved Oxygen

5.5 Instrument or Method Calibration

Most monitoring instruments require calibration before use, and this calibration must be conducted in the field under the ambient climatic conditions that will be present during field sampling. Calibration of monitoring instruments shall be performed in accordance with the manufacturer's specifications and recorded in the provided form in Attachment 1. Site-specific instrument calibration requirements should be specified in the SAP. The following minimum calibration requirements apply to the various types of meters used to gather water quality measurements.

Initial Calibration (IC): Before use, the instrument or meter electronics are adjusted (manually or automatically) to a theoretical value (e.g., DO saturation) or a known value of a calibration standard. An IC is performed in preparation for the first use of an instrument or if a calibration verification does not meet acceptance criteria.

Initial Calibration Verification (ICV): The instrument or meter calibration is checked or verified directly following IC by measuring a calibration standard of known value as if it were a sample and comparing the measured result to the calibration acceptance criteria for the instrument/parameter. If an ICV fails to meet acceptance criteria, immediately recalibrate the instrument using the applicable initial calibration procedure or remove it from service.

Continuing Calibration Verification (CCV): After use, the instrument or meter calibration is checked or verified by measuring a calibration standard of known value as if it were a sample and comparing the measured result to the calibration acceptance criteria for the instrument/parameter.

5.5.1 Calibration Checks

Calibration checks are conducted by measuring a known standard. They must be completed after calibration and should be performed at least one other time (i.e., after lunch) and anytime suspect measurements are encountered. Table 2 provides general acceptance ranges to be used during calibration checks. If a meter is found to be outside of the acceptance range, the meter **must** be recalibrated. If the meter remains out of range, the project manager and/or the supplier of the meter should be contacted to determine alternative measures.

Table 2
Calibration Check Acceptance Limits

Parameter	Acceptance Criteria
Dissolved Oxygen ±0.3 mg/L of the theoretical oxygen solubility	
Oxidation-Reduction Potential	±10 mv from the theoretical standard value at that temperature
pH	±0.2 Standard pH Units
Specific Conductance	±5% of the standard
Turbidity	0.1 to 10 NTU: ±10% of the standard 11 to 40 NTU: ±8% of the standard 41 to 100 NTU: ±6.5% of the standard

Notes:
mg/L = milligrams per liter
mv = millivolts
NTU = nephelometric turbidity units

5.5.2 Possible and Suspected Ranges

The concentration for each parameter range should be known so that concentrations outside of the range can be noted. Table 3 presents the maximum range of the parameter in groundwater. The table also presents the suspected range. Measurements outside of the maximum/minimum range should be considered in error and the measurement method should be checked. Concentrations outside the normal range should be treated as suspect but may be the result of contaminant impact. For example, a pH of 2.0 would be out of the normally suspected range for groundwater but not at a site impacted with an acid.

Table 3
Minimum and Maximum Result Ranges

Parameter	Units	Possible Min	Possible Max	Normal Min	Normal Max	Notes
Dissolved Oxygen	mg/L	0.0	14.6 (0°C) 10.1 (15°C) 8.3 (2°C)	0.0	5	The colder the sample, the higher the DO reading. DO greater than 1 mg/L, ORP positive should not have sulfur odor, sulfide, ferrous iron and/or gray color. DO less than 1 mg/L, ORP negative, may have sulfur odor, sulfide, ferrous iron and/or gray color.
pH	SU	0	14	5	9	pH values exceeding 10 could indicate grout contamination
ORP	mv					DO greater than 1 mg/L, ORP positive should not have sulfur odor, sulfide, ferrous iron and/or gray color. DO less than 1 mg/L, ORP negative, may have sulfur odor, sulfide, ferrous iron and/or gray color.
Specific Conductance	µS/cm			varies	varies	
Temperature	°C	0	100	5	30	
Turbidity	NTU	0	Greater than 1,000	0	Greater than 1,000	50 NTU or greater suggests cloudiness.

Notes:
mg/L = milligrams per liter
°C = degrees Celsius
DO = dissolved oxygen
SU = standard units
ORP = oxidation reduction potential
mv = millivolts
mS/cm = micro Siemens per cm
NTU = nephelometric turbidity units

5.5.3 Field Instruments and Calibration Criteria

The calibration acceptance criteria for each instrument are summarized in Table 4 along with special considerations related to each field instrument.

Table 4
Calibration Check Acceptance Limits

Parameter	Acceptance Criteria
Dissolved Oxygen	±0.3 mg/L of the theoretical oxygen solubility.
Oxidation-Reduction Potential	±10 mv from the theoretical standard value at that temperature.
pH	±0.2 Standard pH Units
Specific Conductance	±5% of the standard
Turbidity	0.1 to 10 NTU: ±10% of the standard 11 to 40 NTU: ±8% of the standard 41 to 100 NTU: ±6.5% of the standard

Notes:
mg/L = milligrams per liter
mv = millivolts
NTU = nephelometric turbidity units

pH Meters

- For the most accurate of pH measurements, pH meters should receive a three-point calibration. However, if a two-point calibration will bracket the groundwater pH of the site, a two-point calibration is acceptable. Three-point calibrations typically include calibrating to solutions of pH 7.00, 4.00, and 10.00. If groundwater pH is outside the calibration range of the solution standards, special buffers must be ordered to bracket the pH. Some meters will report the slope of the calibration and this may be used in checking the meter calibration (refer to the meter's manual). When performing an ICV, the result must be within +/- 0.2 pH units of the stated buffer value.

- pH meters should be calibrated across the range of values to be measured. The maximum and minimum calibration solutions shall be outside the range of anticipated values. For example, if the expected range is between 7.50 and 9.00, the 7.00 and the 10.00 standard should be used for calibration. Perform the IC using at least two buffers, and always use the pH 7.00 buffer first. A reading that is above the maximum (or below the minimum) calibration standard is an estimate only and is not valid. This condition requires obtaining a new standard that is above (or below) the reported value, depending on the measurement.

- A percent slope of less than 90 percent indicates a bad electrode that must be changed or repaired. If percent slope cannot be determined, or the manufacturer's optimum specifications are different, follow the manufacturer's recommendation for maintaining optimum meter performance.

Specific Conductivity Meters

- For IC, when the sample measurements are expected to be 100 microsiemens per centimeter (μS/cm) or greater, use two standard potassium chloride (KCl) solutions that bracket the range of expected sample conductivities. Calibrate the instrument with the first standard. Verify the calibration of the instrument with the second standard, bracketing the range of expected sample values.

- If the instrument can be calibrated with more than one standard, choose additional calibration standards within the range of expected sample values.

- When the sample measurements are expected to be less than 100 μS/cm, a lower bracket is not required, but one standard (KCl) solution that is within the range of expected measurements must be used for the IC and the ICV.

- Accept the calibration if the meter reads within +/- 5 percent of the value of any calibration standard used to verify the calibration.

- Most field instruments read conductivity directly. Record all readings and calculations in the calibration records.

- For CCV, check the meter with at least one KCl standard with a specific conductance in the range of conductivity measured in environmental samples. The reading for the calibration verification must also be within +/- 5 percent of the standard value.

- If new environmental samples are encountered outside the range of the IC, verify the instrument calibration with two standards bracketing the range of sample values. If these calibration verifications fail, recalibrate the instrument.

Dissolved Oxygen Meters

- Before calibrating, check the probe membrane for bubbles, tears, or wrinkles. These conditions require replacement of the membrane in accordance with the manufacturer's directions.

- If the meter provides readings that are off-scale, will not calibrate, or drift, check the leads, contacts, etc., for corrosion and/or short circuits. These conditions require replacement maintenance in accordance with the manufacturer's directions.
- Most DO meters must be calibrated based on an environment of 100 percent humidity and a known elevation and barometric pressure (BP).

- For 100 percent humidity, place the probe in the calibration container with a moist towel and allow the probe to remain, undisturbed, for 10 to 20 minutes.

- The IC is an air calibration at 100% saturation. Before use, verify the meter calibration in water-saturated air to make sure it is properly calibrated and operating correctly. Make a similar verification at the end of the day or sampling event. Follow the manufacturer's instructions for your specific instrument. Allow an appropriate warm up period before IC. Wet the inside of the calibration chamber with water, pour out the excess water (leave a few drops), wipe any droplets off the membrane/sensor and insert the sensor into the chamber (this ensures 100 percent humidity). Allow adequate time for the DO sensor and the air inside the calibration chamber to equilibrate. Once the probe/calibration chamber is stable at ambient temperature, check the air temperature and determine, from the DO versus temperature table (see Attachment 2) what DO should measure. The acceptance criterion for DO ICV is +/- 0.3 mg/L.

- Use the same procedure as above for CCV.

ORP Meters

- Verify electrode response before use in the field.

- Equilibrate the standard solution to the temperature of the sample. The standard solution is based on a 25°C temperature; however, the calibration solution standard's value will require adjustment based on the temperature.

- Immerse the electrodes and gently stir the standard solution in a beaker (or flow cell). Turn the meter on, placing the function switch in the millivolt (mv) mode.

- Let the electrode equilibrate and record the reading to the nearest millivolt. The reading must be within ±10 mv from the theoretical redox standard value at that temperature. If not, determine the problem and correct it before proceeding. Switch to temperature display and read the value.

- Record the mv reading and temperature in the field notebook or in form. Rinse the electrode with distilled water and proceed with the sample measurement, unless using a flow cell. If a flow cell is used, rinse between sample locations.

Turbidity Meters

- Perform an initial calibration using at least two primary standards.

- If the instrument cannot be calibrated with two standards, calibrate the instrument with one standard and verify with a second standard.

- Perform an ICV by reading at least one primary standard as a sample. The acceptance criterion for the ICV depends on the range of turbidity of the standard value:

    1. Standard Value = 0.1 to 10 NTU: the response must be within 10 percent of the standard;

    2. Standard Value = 11 to 40 NTU: the response must be within 8 percent of the standard;

    3. Standard Value = 41 to 100 NTU: the response must be within 6.5 percent of the standard; and

    4. Standard Value greater than 100 NTU: the response must be within 5 percent of the standard.

- Determining the Values of Secondary Standards: Use only those certified by the manufacturer for a specific instrument. Secondary standards may be used for CCVs.

To initially determine the value of a secondary standard, assign the value that is determined immediately after an ICV or verification with primary standards. This is done by reading the secondary standard as a sample. This result must be within the manufacturer's stated tolerance range and +/- 10 percent of the assigned standard value. If the +/- 10 percent criterion is not met, assign this reading as the value of the standard. If the reading is outside the manufacturer's stated tolerance range, discard the secondary standard.

- CCV: Perform a CCV using at least one primary or secondary standard. The calibration acceptance criteria are the same as those for an ICV.

5.6 Direct Measurements

Direct measurements with meters are the most common methods and can be accomplished by placing a sample in a container with the probe or by allowing the water to flow past the probe in a flow cell. The use of a flow-through cell improves measurement quality by allowing the constant flow of water over the probes and reduces interaction of the sample with the atmosphere. Sample cups should be avoided. The quantity of samples, timing, and methodology should be described in the project SAP.

Following calibration of required probes, connect the bottom flow-cell port to the discharge line of the pump. Connect the top port to a discharge line directed to a bucket to collect the purge water. Allow the flow cell to completely fill. As the water flows over the probe, record the measurements. Continue to record the measurements at regular intervals, as specified in the SAP.

When the ambient air temperatures are much higher or lower than the temperature of the water sample, it is best to keep the length of tubing between the wellhead and the flow cell as short as possible to prevent heating or cooling of the water. Tubing and flow-through cell should not be exposed to direct sunlight, particularly in the summer, if at all possible, to avoid heating of water samples.

5.7 Data Acquisitions, Calculations, and Data Reduction

5.7.1 Specific Conductivity Correction Factions

If the meter does not automatically correct for temperature (i.e., read Specific Conductivity) record Conductivity and adjust for temperature upon returning to the office. The following equation can be used to convert Conductivity to Specific Conductivity.

$$K = \frac{(Km)(C))}{1 + 0.0191(\mathrm{T} - 25)}$$

Where:

K	=	Conductivity in μmhos/cm at 25°C
Km	=	Measured conductivity in μmhos/cm at T degrees Celsius
C	=	Cell constant
T	=	Measured temperature of the sample in degrees Celsius;

If the cell constant is 1, the formula for determining conductivity becomes:

$$K = \frac{(Km)}{1 + 0.0191(\mathrm{T} - 25)}$$

5.7.2 Percentage Difference Calculation

For evaluating slope of readings from either a flow cell or a sample cup.

$$\%Difference = \frac{(Highest\ Value - Lowest\ Value)}{(Highest\ Value)}\ x\ 100$$

5.7.3 Convert mm mercury (mmHG) to inches mercury (inHG)

$$mmHG = inHG\ x\ 25.4$$

5.7.4 True Barometric Pressure

For converting BP obtained from a public domain source that is expressed in BP at sea level to BP at the subject site.

$$TrueBP = (BP) - \frac{(2.5\ x\ [Local\ Altitude])}{100}$$

Where: BP is in mmHG and Local Altitude is in feet

Example: BP at site A is 30.49 inHg and elevation is 544 feet, calculate TrueBP

Convert inHG to mmgHG:

mmHg = 30.49 inHg x 25.4 = 774.4 mmHg

Calculate True BP:

TrueBP = (774.4 mmHg) – [2.5 * (544 /100)] = 774.4-13.6 = 760.8 mmHg

6.0 RECORDS

Data will be recorded promptly, legibly, and in indelible ink on the appropriate logbooks and forms. At the completion of a field effort, all logbooks, field data forms, and calibration logs shall be scanned and made electronically available to the project team. The original field forms, calibrations logs, and log book will be maintained in the project file.

7.0 HEALTH AND SAFETY

Detailed Health and Safety requirements can be found in the site specific Health and Safety Plan. Ensure that a Safe Work Assessment and Permit form is filled out daily prior to any work in the field and reviewed with all project personnel in a daily safety brief.

Safety glasses with side shields or goggles and disposable gloves shall be worn during calibration activities.

8.0 REFERENCES

None

9.0 ATTACHMENTS

Attachment 1: Example Field Instrument Calibration Form
Attachment 2: Solubility of Oxygen at Given Temperatures
Attachment 3: Example Field Data Form

Attachment 1

Example Field Instrument Calibration Form

Field Instrument Calibration Form

Calibrated by: ______________________

Date: ______________________

Equipment (Make/Model/Serial#): ______________________

Equipment (Make/Model/Serial#): ______________________

pH (su) — Standard: ± 0.2 standard units

Initial Calibration / Initial Calibration Verification

	Hach SL	Reading	Pine SL	Reading
pH7				
pH4				

Continuing Calibration Verification

	Hach SL	Reading	Deviation	Acceptable Variance (Y/N)
pH7				
pH4				

DO (mg/L) — Standard: ± 0.3 mg/L of theoretical*

IC (Temp:) / **ICV (Temp:)**

Saturation (%)	Reading (%)	Theoretical (mg/L)	Reading (mg/L)
100			

CCV (Temp:)

Saturation (%)	Reading (%)	Deviation	Acceptable Variance (Y/N)
100			

Theoretical (mg/L)	Reading (mg/L)	Deviation	Acceptable Variance (Y/N)

ORP (mV) — Standard: NA

IC (Zobell SL:) / **ICV (Pine SL:)**

TCS (Std/Temp)	Reading	TCS (Std/Temp)	Reading

CCV (Zobell SL:)

TCS (Std/Temp)	Reading	Deviation	Acceptable Variance (Y/N)

Turbidity (ntu) — Standard: ±10% of Standard

Initial Calibration

Standard	Reading

Continuing Calibration Verification

Standard	Reading	Deviation	Acceptable Variance (Y/N)

Conductivity (ms^{c}/cm) — Standard: ± 5% of standard value

IC (YSI SL:) / **ICV (Pine SL:)**

Standard	Reading	Standard	Reading

CCV (YSI SL:)

Standard	Reading	Deviation	Acceptable Variance (Y/N)

Comments:

____

____

____

____

Notes:

SL	solution lot	su	standard units	ntu	Nephelometric Turbidity Units
TCS	temperature corrected standard	mV	millivolts	°C	degrees Celsius
Std	standard	%	percent	ms^{c}/cm	millisiemens per centimeter (temperature corrected)
Temp	temperature	mg/L	milligrams per liter	*	Theoretical value

Attachment 2

Solubility of Oxygen at Given Temperatures

Field Measurement of Dissolved Oxygen

Solubility of Oxygen in Water at Atmospheric Pressure			
Temperature °C	Oxygen Solubility mg/L	Temperature °C	Oxygen Solubility mg/L
0.0	14.621	26.0	8.113
1.0	14.216	27.0	7.968
2.0	13.829	28.0	7.827
3.0	13.460	29.0	7.691
4.0	13.107	30.0	7.559
5.0	12.770	31.0	7.430
6.0	12.447	32.0	7.305
7.0	12.139	33.0	7.183
8.0	11.843	34.0	7.065
9.0	11.559	35.0	6.950
10.0	11.288	36.0	6.837
11.0	11.027	37.0	6.727
12.0	10.777	38.0	6.620
13.0	10.537	39.0	6.515
14.0	10.306	40.0	6.412
15.0	10.084	41.0	6.312
16.0	9.870	42.0	6.213
17.0	9.665	43.0	6.116
18.0	9.467	44.0	6.021
19.0	9.276	45.0	5.927
20.0	9.092	46.0	5.835
21.0	8.915	47.0	5.744
22.0	8.743	48.0	5.654
23.0	8.578	49.0	5.565
24.0	8.418	50.0	5.477
25.0	8.263		

Notes:
The table provides three decimals to aid interpolation
Under equilibrium conditions, the partial pressure of oxygen in air-saturated water is equal to that of the oxygen in water saturated
°C = degrees Celsius
mg/L = milligrams per liter

Attachment 3

Example Field Data Form

WELL DEVELOPMENT & GROUNDWATER SAMPLING FORM

DATE:	JOB NUMBER:	EQUIPMENT (Make/Model #/Serial #):
PROJECT:	EVENT:	/ /
WELL ID:	LOCATION:	/ /
WEATHER CONDITIONS:	AMBIENT TEMP:	/ /
REVIEWED BY:	PERSONNEL:	/ /

WELL DIA:	**WELL DEVELOPMENT**	
TOTAL DEPTH from TOC (ft.):	START:	FINISH:
DEPTH TO WATER from TOC (ft.):	VOLUME PURGED (gal):	
LENGTH OF WATER COL. (ft.):	**GROUNDWATER SAMPLING**	
1 VOLUME OF WATER (gal):	START:	FINISH:
3 VOLUMES OF WATER (gal):	VOLUME PURGED (gal):	
	ANALYSIS:	

WELL DEVELOPMENT PARAMETERS		GW SAMPLING PARAMETERS	
Temperature:	± 1.0° C	Temperature:	± 0.2° C
pH:	± 0.5 standard units	pH:	± 0.2 standard units
Specific Conductance:	± 10% of the past measurement	Specific Conductance:	± 5% of the past measurement
Turbidity:	relatively stable	DO:	≤ 20% saturation
		ORP:	± 10 millivolts
		Turbidity:	≤ 10 NTU

IN-SITU TESTING

Circle one: DEVELOPMENT SAMPLING ☐ Bailer ☐ Pump Description:

Time (hh:mm):												
pH (units):												
Conductivity (mS/cm):												
Turbidity (NTU):												
DO (mg/L): YSI 556												
DO (mg/L): YSI 550												
Temperature (C°):												
ORP (mV):												
Volume Purged (gal):												
Depth to Water (ft):												
							Well Goes Dry While Purging ☐					

SAMPLE DATA

☐ Bailer ☐ Pump Description:

Sample ID	Date (m/d/y)	Time (hh:mm)	Bottles (total to lab)	Filtered (0.45 µm)	Remarks
Purging/Sampling Device Decon Process:					

COMMENTS:

Purge water placed in drum#______________

Page __ of __

Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.

The sampling procedure used must be consistent with the NYSDEC March 1991 SAMPLING GUIDELINES AND PROTOCOLS
http://www.dec.ny.gov/regulations/2636.html with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE) and polypropylene. Additional materials may be acceptable if proven not to contain PFCs. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse should be considered for equipment that does come in contact with PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and "plumbers thread seal tape" contain PFCs.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2º Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

Appendix K

Site-Specific Health and Safety Plan

Universal Health & Safety Plan

NYSDEC Former Duso Chemical Site and Adjacent Mid-Hudson Business Park

North Road and Fulton Street

Poughkeepsie, New York 12601
Dutchess County

Prepared For:

Client Name:	New York State Department of Environmental Conservation Division of Environmental Remediation Remedial Bureau E, Section A
Client Address:	625 Broadway, 12th Floor Albany, New York 12233-7017
Project #:	60647169

Prepared By:

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Preparer:

Name: Peter Burkdorf
Title: EHS Compliance
Date Prepared: October 26, 2021

Peter Burkdorf
Signature

Reviewer
(Office SHER; Area/Regional SHEM, or Business Line SHEM)

Name: Dale “Pete” Wray
Title: SH&E Manager, Environment East
Date Reviewed: October 29, 2021

Dale W. Wray
Signature

Approver:
(Project Manager, Project Director, or BL Lead)

Name: Lindsay Mitchell
Title: Project Manager I
Date Approved: October 29, 2021

Lindsay Mitchell
Signature

Expiration:	**October 29, 2022**	Valid for one (1) year maximum <u>or</u> until the scope of work, subcontractor(s), methods and/or equipment change.

HASP Summary

Note: This Summary is intended to provide key information only and cannot be substituted for reading, understanding and complying with the full HASP, including the Emergency response section. This summary may be continually updated as tasks and personnel change. Use Continuation Sheets if necessary.

Client Name:	New York State Department of Environmental Conservation Division of Environmental Remediation Remedial Bureau E, Section A
Site Name:	NYSDEC Former Duso Chemical Site and Adjacent Mid-Hudson Business Park
SH&E Incident Reporting	**SH&E Incident Hotline 1-800-348-5046** TOLL-FREE | 24 HOURS PER DAY | 7 DAYS PER WEEK Immediately report all incidents including any potential work-related injuries, illnesses, discomfort/pain, property damage, security issues, regulatory inspections and environmental impacts/spills.

Medical Treatment Resources

Identify the closest hospital to the site to be used in emergency situations. For non-emergency situations, identify the nearest Occupational Clinic to the site that accepts AECOM Workers Compensation Insurance (see **Attachment A** for instructions and to attach maps and directions).

AECOM Occupation Nurse:	**1-512-419-5016 |** *24 HOURS PER DAY | 7 DAYS PER WEEK*		
Nearest Occupational Clinic	Occupational Health Service		
Address:	2070 Route 52, Hopewell Junction, NY 12533		
Clinic Hours of Operation:	9:00 am to 5:00 pm	**Phone Number:**	(845) 894-9977
Nearest Hospital:	Mid-Hudson Regional Hospital of Westchester Medical Center		
Address:	241 North Road, Poughkeepsie, New York		
Hospital Hours of Operation:	24/7	**Phone Number:**	(845) 483-5000

Key Personnel

Project Manager (PM):	Lindsay Mitchell	**Contact No.:**	(845) 430-7589
Site Supervisor (SS):	Chris French	**Contact No.:**	(518) 860-3855
Site Safety Officer (SSO):	Chris French	**Contact No.:**	(518) 860-3855
Regional SH&E Manager:	Tony Indorato	**Contact No.:**	(757) 298-1563
Area/Practice SH&E Manager:	Pete Wray	**Contact No.:**	(302) 660-9178
Client Contact:	David Chiusano	**Contact No.:**	(518) 598-7753

Table of Contents

Attachments

1. Introduction

This written Health and Safety Plan (HASP) is designed to identify, evaluate, and control safety and health hazards, and to outline emergency response actions for AECOM-managed activities. This HASP must be kept on site during work activities and made available to all workers including subcontractors and other site occupants for informational purposes. AECOM subcontractors are expected to independently characterize, assess and control site hazards created by their specific scope of work.

This section of the HASP summarizes important AECOM SH&E Procedures that apply to all DCS Americas jobs. See **Attachment C** for the project Task Hazard Assessment (THA) forms and **Attachment D** for a list of applicable field SH&E Procedures. These field SH&E procedures must be readily available to the field employees (i.e. PDF, electronically, etc.).

1.1 Applicable References

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

- Federal Occupational Safety and Health Administration (OSHA) Code of Federal Regulation Title 29, Part 1910 (29 CFR Part 1910), Safety and Health Regulations for General Industry and 29 CFR 1926, Safety and Health Regulations for Construction.
- National Institute for Occupational Safety and Health/Occupational Safety and Hazards Administration/U.S. Coast Guard/U.S. Environmental Protection Agency, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Publication No. 85-115, 1985.
- The requirements in this HASP also conform to AECOM's Safety for Life Program requirements as specified in the AECOM Safety, Health and Environment (SH&E) Manual.
- All applicable site-specific scopes of work and Work Plans for the project, including the Site Management Plan.

2. Site Description

This section provides a general description and historical information associated with the site.

The Duso Site and Mid-Hudson Business Park (MHBP) Treatment Area are located in Poughkeepsie, Dutchess County, New York, approximately 0.5 miles east of the Hudson River on Fulton Street. The Duso Site is approximately 0.7 acres in size, while the MHBP Treatment Area consists of approximately 2 acres of a 5.8-acre property. The MHBP Treatment Area is on the southeastern portion of the MHBP property located at the corner of North Road (Route 9N) and Fulton Street.

Both sites are in the State Superfund Program under the Duso Site No. 314103.

2.1 Site Background/History

The former Duso Chemical site was historically occupied by the Duso Chemical Company and is now owned by Star Gas Properties, Inc., which operates a propane distribution facility. The Duso Chemical Company operated a chemical warehouse and distribution business from 1950 through 1963. The Duso Site is relatively level, sloping gently to the west. A steep embankment borders the property to the east and a former railroad right-of-way (ROW) and intermittent stream/swale border the property to the west. The Site is located within a mixed neighborhood of commercial establishments and residential properties. The Duso Site property is currently operated by Star Gas Products, Inc. (Star Gas), a propane distribution facility. Star Gas contains three buildings, a shed, and several aboveground propane storage tanks.

The MHBP Treatment Area is located to the west of the Former Duso Chemical New York State Superfund site. There is a business park and shopping center to the west and north of the MHBP Treatment Area. The MHBP Treatment Area consists of open unpaved and paved ground, and a building. The on-site building is currently vacant. The northern end of the building was formerly occupied by Staples (office products) until spring 2016. The topography of the site and surrounding properties is relatively level. A narrow property owned by New York Central Lines, LLC is present between the Duso Site and MHBP Treatment Area. This narrow property is the location of a former railroad ROW and intermittent stream/swale which borders the MHBP Treatment Area to the east. The swale directs flow off-site to a Municipal Separate Storm Sewer System and, eventually, to the Hudson River. At the eastern property line, the ground surface rises rapidly to the east forming a low ridge.

As a result of a fire at the Duso Chemical Company warehouse in 1963 (Chazen, 1998), releases of various volatile organic compounds (VOCs) occurred to the environment. Migration of contaminants from the Former Duso Chemical property through the Conrail (now CSX) property, to the MHBP Treatment Area likely took place following a sudden discharge of chemicals during the fire and subsequent fire-fighting activities.

From 1910 to 1917, FIAT of Poughkeepsie manufactured approximately 2,000 automobiles at what is now the MHBP property. Western Publishing began production in a corner of the property in 1935. By the 1950s the plant grew to nearly 400,000 square feet. Operations at the facility included photography, lithography plate production, printing operations, coating, gluing and binding operations, and general plant operations and maintenance. The facility used inks, dyes and solvents, which were transported to the facility by truck and tanker. Large items like roll paper and some ink products were transported to the facility by rail. Types of chemicals used at the facility, as identified by a former employee, included acetone, benzene, carbon tetrachloride, isopropyl alcohol, kerosene, Salvasol #5, 1,1,1-trichloroethane (1,1,1-TCA) and trichloroethene (TCE). Some of these chemicals were reported to have been purchased from the Duso Chemical Company (Chazen 1998).

Historical environmental investigation and remedial activities that have taken place on the properties include Phase I and Phase II investigations, a remedial investigation, installation of a sub-slab depressurization system (SSDS) within the Star Gas Products, Inc. main building, an enhanced in-situ bioremediation pilot study on the Duso Site, and thermal remediation beneath the MHBP Treatment Area. Regular groundwater monitoring events have also been performed on both properties.

2.2 Client and/or Third-Party Operations at Site

The Duso Site is currently occupied by Star Gas Products and is an active propane distribution facility. Work performed on the property must be coordinated with the property owner in advance of scheduled activities, and attention should be paid to vehicle traffic on-site, as many of the groundwater monitoring locations are located in or adjacent to crushed stone access roads/driveways.

The MHBP Treatment Area consists of a portion of a building that is currently abandoned, to the north of which a former Staples Store is located. A large concrete pad is present to the west of the building, Fulton Street is to the south and an irregularly shaped asphalt parking area and an access road that runs north-south along the back of a shopping plaza is located to the east. There are not currently active operations on this property.

Between these two properties is a former railroad right-of-way owned by CSX. The right-of-way is currently a vegetated drainage swale which regularly contains surface water flow and discharges to an outfall that leads to the City of Poughkeepsie Wastewater Treatment Plant. No railroad tracks are present in the right-of-way/drainage swale.

2.3 Scope of Work

AECOM will conduct various services at the site. Work will be performed in accordance with the applicable Scope of Work (SOW) and associated Work Plans developed for this site, including the Site Management Plan. A description of these activities is summarized below.

- Groundwater monitoring will be performed biannually 2019 and then annually thereafter to assess the performance of the EISB remedial activity on the Duso Site and the ERH Treatment at the MHBP Treatment Area. The monitoring well network has been designed to monitor upgradient, on-site and downgradient groundwater conditions at the Duso Site and MHBP Treatment Area. At least fifteen (15) monitoring wells will be included in the monitoring well network. Samples will be analyzed to assess the performance of both remedies. Groundwater monitoring will either be performed by an environmental subconsultant (Envirospec Engineering) or by AECOM personnel.
- Prior to sample collection, depth to water measurements will be collected with an electronic water level meter from all accessible wells the same day. Prior to measuring, the wells will be opened and allowed to equilibrate to atmospheric pressure. After equilibration, depth to water measurements will be taken to the hundredth of a foot. Following water level measurements, low-flow sampling techniques will be used. A peristaltic pump (or similar adjustable flow rate pump) will be used to purge the wells. The pump intake will be set at the midpoint of the saturated screened interval. The pump will be operated at a flow rate of approximately 100 to 500 milliliters per minute (mL/m) and water levels will be monitored to ensure that the pumping rate causes minimal/no drawdown. Dedicated tubing will be used for groundwater sample collection. Field parameters will be recorded on the Well Sampling Form every five minutes during purging. A flow-through cell will be used to obtain temperature, pH, specific conductance, DO, and ORP. Turbidity will be measured using a separate instrument. During sample collection, the flow-through cell will be disconnected, and the sample tubing discharge will be directed into the laboratory-supplied sample containers. Samples collected for laboratory analysis will be transported to the laboratory or delivered via FedEx to the laboratory on the day of collection if possible; otherwise samples will be delivered on the day after collection, following proper identification, chain-of-custody, preservation, and packaging procedures.
- Decontamination will include scrubbing/washing with a laboratory grade detergent (e.g., Alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses.
- Investigation-Derived Waste (IDW) Management: IDW will be collected and categorized. Potentially hazardous and non-hazardous IDW (purge water, decontamination fluids, and soil cuttings [if any]) will be tested and disposed of within 90 calendar days of completing the field activities. Potentially hazardous IDW will be staged on-site, and then delivered to an appropriate treatment and disposal facility for processing by a qualified subcontractor. Non-hazardous IDW such as personal protective equipment and disposable sampling equipment will be placed in plastic garbage bags for disposal as solid waste in a timely fashion during fieldwork.
- Geophysical/Utility Survey: A third party contractor (Advanced Geological Services) will be performing a geophysical and utility survey of the area which includes the CSX drainage swale and the eastern portion of the MHBP Treatment Area in order to identify and mark locations of underground utilities and potential void spaces beneath the ground surface. AECOM will provide oversight and direction of the subcontractor.
- Treatability Study: Bulk soil and groundwater samples will be collected for shipment to a subcontractor (Peroxychem) for the purpose of a four-month long treatability study. A minimum of three Geoprobe borings will be installed by a subcontractor (Aztech Environmental Technologies) and soil will be logged and collected by an AECOM geologist. Additionally, a minimum of two monitoring wells will be purged via low-flow methods (see

above) and sampled for approximately 20 liters of groundwater each. AECOM will provide oversight and direction of the drilling subcontractor.

A Task Hazard Assessment (THA) for each operation being performed by AECOM must be included in **Attachment C**, while those performed by the managed subcontractors should be prepared by the subcontractor.

Task Name	Permit(s) Required		Primary Task Performed By		
			AECOM	SUB	Third-Party
Coronavirus Precautions Field Office Travel	☐ Yes	☐ No	☒	☐	☐
Driving To and From the Site	☐ Yes	☐ No	☒	☐	☐
Geoprobe Drilling Oversight	☐ Yes	☐ No	☒	☐	☐
Groundwater Sampling - Low Flow	☐ Yes	☐ No	☒	☐	☐
Traffic Control For Working Adjacent to a Roadway	☐ Yes	☐ No	☒	☐	☐

2.4 Key Dates

Project Start Date:	November 1, 2021
Field Work Start Date:	November 1, 2021
Project Completion Date:	July 31, 2023

2.5 High Potential Hazard Activities

In general, the following tasks are considered High Potential (HiPo) Hazard Activities, as identified in S3AM-209-PR1, Risk Assessment, based on the factors contributing to the severity and probability of credible outcomes resulting from ineffective mitigation of their hazards. Additional tasks or activities could be added to the list below based on a similar assessment of their hazards and associated control measures. The following HiPo tasks will be required to complete the approved scope of work.

High potential hazard activities may require additional documents such as: permit to work, site specific plans, task/equipment-specific training, pre-use inspections, a competent person, etc. These requirements are listed under the high potential hazard activities as a reminder that you must implement them prior to performing the activity.

All procedures referenced in the table below MUST be included in **Attachment D** for implementation into this HASP.

☒	**Drilling, Boring and Direct Push Probing** – Qualified/trained operators, pre-use inspection (S3AM-321-FM1) and THA required. Follow requirements in S3AM-321-PR1.
☒	**Hand/Power Tools – Working with Power Tools/Equipment (drill, chainsaw, grinder, power saw, pressure washer, etc.)** – Qualified/trained operators, pre-use inspections (see inspection checklists in S3AM-305-FM2) and THA required. Follow the requirements in S3AM-305-PR1.
☒	**Heavy Equipment – Working with/Operating or Working near Heavy Equipment, Mobile Equipment or Drill Rigs** – Qualified/trained operators, competent person, pre-use operations inspections (S3AM-309-FM02) and THA required. Follow the requirements in S3AM-309-PR1.
☒	**Overhead Lines and Obstructions** – Visual verification of overhead lines prior to start of work and THA required. Follow the requirements in S3AM-322-PR1.
☒	**Underground Utilities** – Site walk, completion of the Underground Utilities and Subsurface Installations checklist (S3AM-331-FM1) and THA required. Follow the requirements in S3AM-331-PR1.
☒	**Other**: *Please Specify:* **Cold Stress (**S3NA-112-PR1 Cold Stress (aecom.com)**), Heat Stress (**S3NA-113-PR1 Heat Stress (aecom.com)**)**

2.6 Physical and Biological Hazards

Physical and biological hazards are hazards that threaten the physical safety of an individual; contact with the hazard typically results in an incident or injury. The following table summarizes the physical and biological hazards present at the site and the associated procedures that address protection and prevention of harm.

If a there is a potential of physical or biological hazard when performing a specific task, it must be addressed in the THA.

All checked procedures MUST be included in **Attachment D** for implementation and reference. The following hazards and their site-specific description are anticipated based on the scope of work and project site:

	Hazard/ Activity (Note: Text in this column links to procedure)	Site Specific Description (Where, What Phase of Work, Frequency, Etc.)	Applicable Procedure
☐	**Abrasive Blasting**		S3AM-335-PR1
☐	**Asbestos** (Competent Person required)		S3AM-109-PR1
☐	**Assured Equipment Grounding** (Competent Person required)		S3AM-302-PR1
☐	**Blasting and Explosives** (Competent Person Required)		S3AM-336-PR1
☐	**Bloodborne Pathogens**		S3AM-111-PR1
☐	**Cofferdams**		S3AM-344-PR1
☒	**Cold Stress** (Continuous exposure when ambient air temperature is below 32°F (0°C) **or** when ambient air temperature is below 50°F (10°C) with wet/damp conditions.)	November 2021 - One day of soil boring oversight/sampling; three days of groundwater sampling – daylight hours only	S3AM-112-PR1
☐	**Compressed Air Systems and Testing**		S3AM-337-PR1
☐	**Compressed Gases**		S3AM-114-PR1
☐	**Concrete Work** (Competent Person required)		S3AM-338-PR1
☐	**Corrosive Reactive Materials**		S3AM-125-PR1
☐	**Demolition** (Competent Person required)		S3AM-339-PR1
☐	**Driving Safety**		S3AM-005-PR1
☐	**Flammable and Combustible Liquids**		S3AM-126-PR1
☐	**Gauge Source Radiation**		S3AM-122-PR1
☐	**Generator Use**		S3AM-302-ATT2
☒	**Hand Safety**	During all Field activities	S3AM-317-PR1
☒	**Heat Stress** (Continuous exposure when ambient air temperature is above 80°F (26.6°C) and a standard work uniform is worn **or** when ambient air temperature is above 70°F (21.1°C) and impermeable chemical protective clothing is worn.)	Spring 2023 - Three days of groundwater sampling – daylight hours only	S3AM-113-PR1
☐	**High Altitude**		S3AM-124-PR1

	Hazard/ Activity (Note: Text in this column links to procedure)	Site Specific Description (Where, What Phase of Work, Frequency, Etc.)	Applicable Procedure
☐	**Hoists Elevators and Conveyors** (Competent Person required)		S3AM-343-PR1
☐	**Ladders** (Competent Person required)		S3AM-312-PR1
☐	**Lead** (Competent Person required)		S3AM-110-PR1
☐	**Machine Guarding Safe Work Practice**		S3AM-326-PR1
☐	**Marine Safety and Vessel Operations**		S3AM-333-PR1
☐	**Material Storage**		S3AM-316-PR1
☐	**Mine Site Activities**		S3AM-341-PR1
☐	**Mining Operations**		S3AM-345-PR1
☐	**Noise** (Competent Person required)		S3AM-118-PR1
☒	**Non-Ionizing Radiation**	Frequent exposure to sunlight during daylight hours	S3AM-121-PR1
☐	**Overhead Lines**		S3AM-322-PR1
☒	**Pandemic Virus**	Potential exposure during travel and field task(s) – Employees to travel to site separately; work is performed outdoors.	SR1-003-PR2
☐	**Powder-Actuated Tools**		S3AM-327-PR1
☐	**Powered Industrial Trucks**		S3AM-324-PR1
☐	**Slips, Trips, Falls**		S3AM-013-PR1
☐	**Steel Erection** (Competent Person required)		S3AM-340-PR1
☐	**Temp. Floors, Stairs, Railings, Toe-boards**		S3AM-342-PR1
☒	**Underground Utilities**	November 2021 – Soil boring installation. Public utility mark-out; geophysical survey performed in July 2019.	S3AM-331-PR1
☐	**Underground Work** (Competent Person required)		S3AM-330-PR1
☒	**Wildlife, Plants and Insects**	Drainage ditch between two site properties may have biological hazards.	S3AM-313-PR1

2.6.1 COVID-19 Pandemic

COVID-19 is a disease that results from infection of the virus identified as SARS-CoV-2. SARS-CoV-2 is a Coronavirus, one of a large family of viruses found in both animals and humans, and one which has caused significant loss of life in the past year. As of early 2021, infection rates remain high, though several vaccines are now available and vaccination efforts are ongoing.

Key AECOM resources can be found at the AECOM Ecosystem Coronavirus Information Centre on the Ecosystem homepage or at this link, the Coronavirus Smart Card, and the AECOM Pandemic Procedure: SR1-003-PR2. Additional resources can be found at the following non-AECOM websites:

- Centre for Disease Control and Prevention (CDC).
- World Health Organization (WHO).

As of August 2021, AECOM's policies require a face covering for unvaccinated individuals unless they can maintain a social distance of 6 feet at all times. Unvaccinated individuals may forgo masks. However, many clients, cities, counties, regions, and states have stricter requirements. AECOM defaults to stricter requirements wherever mandates are in effect.

2.7 Hazards/ Constituents of Concern

Based on information obtained from historical investigations and other sources, the chemicals in the table below are known or suspected to be present at the site.

Summary of Hazardous Properties of Contaminant Exposure Hazards

***Notes: PEL** = Permissible Exposure Limit | **TLV** = Threshold Limit Value | **IP** = Ionization Potential | **eV** = Electron Volt*

Chemical Name	Media		Primary Routes of Exposure	PEL	TLV	IP (eV)
Other Common Site COCs						
1,1,1-Trichloroethane	☒ Soil ☐ Vapour	☒ Groundwater ☐ Other OR N/A	Inhalation, absorption	350 ppm	350 ppm	9.32
1,1-Dichloroethane	☒ Soil ☐ Vapour	☒ Groundwater ☐ Other OR N/A	Inhalation, absorption	100 ppm	100 ppm	9.32
1,2-Dichloroethane	☒ Soil ☐ Vapour	☒ Groundwater ☐ Other OR N/A	Inhalation, absorption	1 ppm	10 ppm	9.32
Chloroethane	☒ Soil ☐ Vapour	☒ Groundwater ☐ Other OR N/A	Inhalation, absorption	N/A	N/A	9.32
1,1-Dichloroethene	☒ Soil ☐ Vapour	☒ Groundwater ☐ Other OR N/A	Inhalation, absorption	N/A	N/A	9.32
cis-1,2-Dichloroethene	☒ Soil ☐ Vapour	☒ Groundwater ☐ Other OR N/A	Inhalation, absorption	200 ppm	200 ppm	9.32
Vinyl chloride	☒ Soil ☐ Vapour	☒ Groundwater ☐ Other OR N/A	Inhalation, absorption	1 ppm	1 ppm	9.32

Notes: 1. Exposure limits based on DDT.
2. Exposure limits based on Chlordane. No PELs are set for alpha or gamma chlordane.

2.8 Decontamination

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities. Decontamination steps are outlined in the Hazardous Waste Operations procedure S3AM-117-PR1.

All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ).

Decontamination Procedures & Equipment	
Procedure	**Equipment Needed**
Scrubbing/washing with a laboratory grade detergent to remove visible contamination, followed by water rinses	Alconox, 5-gallon buckets, scrub brush, potable (tap) water or analyte-free water

Equipment Decontamination Procedures

Type Equipment	Decontamination Solution	Procedure
Geoprobe equipment	Decon pad or buckets	Scrubbing/washing with a laboratory grade detergent to remove visible contamination, followed by water rinses

2.9 Air Monitoring

2.9.1 Real Time Exposure Measurements/Equipment

Monitoring shall be performed within the work area on site to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in the work permit and THA as work is performed. All instrumentation needs to be rated intrinsically safe to prevent fire or explosion.

Instrument		Manufacturer/Model	Substances Detected
☒	**Photo Ionization Detector (PID)**	■ RAE Systems mini-RAE ■ Photovac Microtip ■ HNu Model Hnu (min. 10.6 eV bulb)	■ Petroleum hydrocarbons ■ Organic Solvents
☐	**Multi or 4 Gas Detectors**	■ RAE Systems Multi-RAE	■ Lower Explosive Limit ■ Oxygen ■ Carbon Monoxide ■ Hydrogen Sulfide
☐	**Combustible Gas Indicator (CGI)** *May be combined with individual or multi-gas detectors.*		■ Explosivity
☐	**Particulate Monitor**	■ MIE Model PDM-3 mini-RAM	■ Aerosols, mist, dust, and fumes
☐	**Personal Monitoring/ Badges**	■ N/A	■ N/A

2.9.2 Monitoring Procedures

The monitoring procedures shown below are general guidelines for sampling activities. In general, readings are considered actionable if sustained readings are observed for 5 minutes or more or if intermittent peaks are seen in excess of 1 time the action level. A reading in excess of action level outlined below will require additional ventilation (natural or mechanical) for 30 minutes, followed by re-monitoring.

Monitoring Procedures and Action Levels

	Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
☒	**Volatile Organic Compounds (VOCs) and Volatile Hydrocarbons** (total by PID)	Breathing zone, continuously during tasks where exposure to VOCs and volatile hydrocarbons is possible	< 5 ppm	■ Continue monitoring, may continue work in required PPE
			5- 25 ppm (sustained for 5 minutes)	■ **STOP WORK** and notify PM. Investigate the cause of elevated VOC measurements and identify measures to reduce concentrations (cover impacted soils, ventilation, etc.). Work activities

Monitoring Procedures and Action Levels

	Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
				shall only continue once levels have decreased to or below 5 units above background. If levels continue above 5 units, only individuals who are medically qualified to wear respiratory protection are permitted to continue work activities with Project Manager approval. Don Level C PPE (organic vapour respirator cartridges), continue monitoring, and initiate continuous air monitoring for benzene.
			> 25 ppm (sustained for 5 minutes)	■ Cease work, exit, and contact the Site Safety Officer, Site Supervisor, and Project Manager.
☐	**Benzene** (by PID with benzene-specific separation tube)	Breathing zone, continuously where indicated by VOC readings	> 0.25 ppm	■ Cease work, exit the area, and contact the Site Safety Officer, Site Supervisor, and Project Manager.
☐	**Hydrogen Sulfide** (multi-gas detector or individual H_2S meter)	Breathing zone, continuously during tasks where exposure to hydrogen sulfide is possible	< 5 ppm	■ Continue work activities. Contact the Site Safety Officer to investigate the potential for contributing factors.
			> 5 ppm	■ Cease work, exit the area or confined space, and contact the Site Safety Officer, Site Supervisor and Project Manager.
☐	**Combustible Gas** (multi-gas meter or individual combustible gas indicator, CGI)	Breathing zone or in the immediate work area continuously during tasks where explosive atmospheres are possible	> 5% of LEL	■ Cease work, exit, and contact the Site Safety Officer, Site Supervisor, and Project Manager.
☐	**Oxygen (O_2)** (multi-gas detector or individual O_2 meter)	Breathing zone, continuously during tasks were oxygen enriched or deficient atmospheres are possible	< 19.5 % O_2	■ Cease work deficient atmosphere), exit the area or confined space, and contact the Site Safety Officer, Site Supervisor, and Project Manager.
			> 23.5 % O_2	■ Cease work enriched atmosphere), exit the area or confined space, and contact the Site Safety Officer, Site Supervisor, and Project Manager.
☐	**Carbon Monoxide (CO)** (multi-gas detector or individual CO meter)	Breathing zone, continuously during tasks where exposure to CO is possible	< 10 ppm	■ Continue work in Level D and continue monitoring
			> 10 ppm	■ Cease work, exit the area or confined space, and contact the Site Safety Officer, Site Supervisor, and Project Manager.
☐	**Dust not otherwise classified** (total by aerosol monitor)	Breathing zone every 30 minutes during field activities where exposure to excessive dusts are possible	< 5 mg/m^3	■ Continue work in Level D and continue monitoring
			> 5 mg/m^3	■ Upgrade to Level C (P100 respirator cartridges), implement dust suppression measures; contact the Site Safety Officer & Site Supervisor.
			> 10 mg/m^3	■ Cease activities, implement more effective dust suppression measures; contact the Site Safety Officer & Site Supervisor.

Monitoring Procedures and Action Levels

	Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
☐	**Dust not otherwise classified** (total by aerosol monitor)	Edge of Exclusion Zone, every 30 minutes during excavation activities	< 5 mg/m^3	■ Continue work in required PPE, monitor air, and implement engineering controls
			> 5 mg/m^3	■ Cease activities and contact the Site Safety Officer & Site Supervisor.
☐	**Other:** N/A			■ Continue monitoring ■ Continue work in the required PPE
				■ **STOP WORK** and exit the work area or confined space ■ Contact the Site Safety Officer, Site Supervisor, and Project Manager
☐	**Facility Chemical Release**	Breathing zone within designated areas/buildings or site-wide, as appropriate for the facility/site	Chemical Release Detected	1. **STOP WORK** and immediately leave the area/building 2. Report to the designated muster location 3. Contact the Site Safety Officer, Site Supervisor and Project Manager 4. Wait for All-Clear to return to work area

3. Personnel Responsible for Safety

Enter the personnel responsible for safety:

Role	Person Assigned to Role (Required)	Contact No. Primary (Required)	Contact No. Alt (Recommended)
AECOM Project Manager:	Lindsay Mitchell	(845) 430-7589	(518) 951-2373
AECOM Site Supervisor:	Chris French	(518) 860-3855	(518) 951-2204
AECOM Site Safety Officer:	Chris French	(518) 860-3855	(518) 951-2204
AECOM SH&E Manager:	Pete Wray	(302) 660-9178	(302) 318-2880

4. Subcontractor Management

4.1 Subcontractor Pre-Qualification

Ensure all subcontractors including lower tier subcontractors are prequalified to perform work for AECOM. SubPort is the preferred method for pre-qualifying subcontractors. If a subcontractor is conditionally approved, ensure the subcontractor meets all conditions of approval.

If a subcontractor requires a variance, complete the Subcontractor Variance form, S3AM-213-FM2.

Complete the table below, identifying all AECOM-Controlled subcontractors working in the field (any contractor paid directly by AECOM or otherwise under our responsibility is considered AECOM—Controlled, even if we do not directly control their day-to-day operations or supervise their work).

Subcontractor 1:	Cascade Drilling (Provide exact Subcontractor name as listed in Support)	
Scope of Work:	**High-Risk Tasks performed?**	**Contractor Site Safety Officer & Contacts:**
Describe Contractor's Scope of Field Work	**See SWP Cover Sheet for List of High-Risk Tasks**	**Provide Name and Cell Phone**
Geoprobe Soil Boring	☒ Yes (List) Extreme Heat and Cold, Hazardous Substances, Work around live traffic, Operating heavy equipment and machinery ☐ No	Ethan Plank O: 518.355.2201 EXT 2471 M: 518.265.7471 eplank@cascade-env.com

Required Subcontractor Documents: PM must verify that the following documents are in-place for each subcontractor; check to verify.		
☒ Copy of their Project/Site-specific health and safety plan	☒ Copy of task specific THAs/JHAs and inspection/tailgate forms	☒ Copy of the signed contract
☒ Copy of their business license and training certificates (task specific)	☒ Copy of their Corporate Safety Management Manual	☐ Other n/a

Subport Review: ☐ Approved – Skip to next Subcontractor
☒ Conditionally Approved - Identify conditions and controls below.
Check 'common subport conditions' that apply, add additional conditions, and describe how the conditions will be met

Subport Conditions (check or add any that apply)	**How will the condition be met?**
☒ AECOM Safety Plan must cover Subcontractor's work, and Subcontractor must provide a THA for their tasks	Subcontractor to provide THA for their daily activities
☐ PM must verify that Subcontractor adheres to AECOM safety plan	n/a
☐ Subcontractor variance is required - the form can be found at this link: https://myecosystem.aecom.com/ppf/forms/Forms/S3NA_213_FM2_Subcontractor%20Variance%20Form.docx	n/a
☐ Supervision required	n/a
☐ Special Conditions apply (related to Demolition, Diving, Underbridge Inspection Unit work, and Rope Access Work	n/a
☐ Other conditions apply (Identify)	n/a

Subcontractor 2:	Microbial Insights (No Field Work) (Provide exact Subcontractor name as listed in Support)	
Scope of Work:	**High-Risk Tasks performed?**	**Contractor Site Safety Officer & Contacts:**
Describe Contractor's Scope of Field Work	**See SWP Cover Sheet for List of High-Risk Tasks**	**Provide Name and Cell Phone**
Laboratory (No Field Work)	☐ Yes (List) n/a ☒ No	Kate Clark O: 865.573.8188 ext. 100 KClark@microbe.com

Required Subcontractor Documents: PM must verify that the following documents are in-place for each subcontractor; check to verify.		
☐ Copy of their Project/Site-specific health and safety plan	☐ Copy of task specific THAs/JHAs and inspection/tailgate forms	☐ Copy of the signed contract
☐ Copy of their business license and training certificates (task specific)	☐ Copy of their Corporate Safety Management Manual	☐ Other N/A

Subport Review: ☐ Approved – Skip to next Subcontractor
☐ Conditionally Approved - Identify conditions and controls below.

Check 'common subport conditions' that apply, add additional conditions, and describe how the conditions will be met

Subport Conditions (check or add any that apply)	**How will the condition be met?**
☐ AECOM Safety Plan must cover Subcontractor's work, and Subcontractor must provide a THA for their tasks	N/A
☐ PM must verify that Subcontractor adheres to AECOM safety plan	N/A
☐ Subcontractor variance is required - the form can be found at this link: https://myecosystem.aecom.com/ppf/forms/Forms/S3NA_213_FM2_Subcontractor%20Variance%20Form.docx	N/A
☐ Supervision required	N/A
☐ Special Conditions apply (related to Demolition, Diving, Underbridge Inspection Unit work, and Rope Access Work	N/A
☐ Other conditions apply (Identify)	N/A

Subcontractor 3:	Peroxychem (No Field Work) (Provide exact Subcontractor name as listed in Support)	
Scope of Work:	**High-Risk Tasks performed?**	**Contractor Site Safety Officer & Contacts:**
Describe Contractor's Scope of Field Work	**See SWP Cover Sheet for List of High-Risk Tasks**	**Provide Name and Cell Phone**
Treatability Study (No Field Work)	☐ Yes (List) n/a ☒ No	Ravi Srirangam O: (312) 480-5250 Ravi.Srirangam@Evonik.com

Required Subcontractor Documents: PM must verify that the following documents are in-place for each subcontractor; check to verify.		
☐ Copy of their Project/Site-specific health and safety plan	☐ Copy of task specific THAs/JHAs and inspection/tailgate forms	☐ Copy of the signed contract
☐ Copy of their business license and training certificates (task specific)	☐ Copy of their Corporate Safety Management Manual	☐ Other N/A

Subport Review: ☐ Approved – Skip to next Subcontractor
☐ Conditionally Approved - Identify conditions and controls below.

Check 'common subport conditions' that apply, add additional conditions, and describe how the conditions will be met	
Subport Conditions (check or add any that apply)	**How will the condition be met?**
☐ AECOM Safety Plan must cover Subcontractor's work, and Subcontractor must provide a THA for their tasks	N/A
☐ PM must verify that Subcontractor adheres to AECOM safety plan	N/A
☐ Subcontractor variance is required - the form can be found at this link: https://myecosystem.aecom.com/ppf/forms/Forms/S3NA_213_FM2_Subcontractor%20Variance%20Form.docx	N/A
☐ Supervision required	N/A
☐ Special Conditions apply (related to Demolition, Diving, Underbridge Inspection Unit work, and Rope Access Work	N/A
☐ Other conditions apply (Identify)	N/A

Attach additional sheets as required to account for each subcontractor performing field work.

5. Training and Documentation

All personnel at this site must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure S3AM-003-PR1 establishes the general training requirements for AECOM employees.

5.1 Site-Specific Training Requirements

Check all required training on the table below. Verify training records of employees and subcontractors.

Site Specific Training Requirements

	Training	Applies to
☒	**ERP/HASP and Site Orientation**	All Employees and Subcontractors
☐	**Vehicle/Driver Safety & Defensive Driving**	All Employees who drive on behalf of AECOM
☒	**Field Safety**	Employees visiting the field that does not require HAZWOPER
☒	**Speak Up/Listen Up (SULU)**	All AECOM field employees and supervisors
☐	**First Aid / CPR**	Designated employees or employees performing high risk activities and medical attention is more than 4 minutes away
☐	**Respiratory Protection & Fit Test**	Employees needing to wear respirators
☐	**OSHA 10-Hr. Construction Safety (or CSTS 2020 in Canada)**	All employees working on jobsites with construction type hazards
☐	**OSHA 30-Hr. Construction Safety**	All employees supervising/overseeing jobsites with construction type hazards
☒	**HAZWOPER 40-Hour and 8-Hr. Annual Refresher**	On HAZWOPER sites, in EZ, exposed to hazardous contamination
☒	**HAZWOPER Supervisor**	Employees managing others in HAZWOPER activities or at HAZWOPER Sites
☐	**Hazardous Materials Shipping (U.S.)**	Employee responsible for shipping HZM/HZW/DG and/or signing manifests
☐	**Hazardous Materials Communication**	When hazardous or toxic chemicals are being used on site.
☐	**Transportation of Dangerous Goods (CAN)**	Employees responsible for shipping/transporting regulated hazardous materials that exceed regulatory requirements
☐	**Under Bridge Inspection Unit (UBIU) AECOM University module**	Employees working in a UBIU
☐	Local and/or Client Requirements:	N/A
☐	Other:	N/A

6. Site Control

6.1 Site Work Zones

Site layout and site control need to be coordinated to achieve a productive work environment and efficient work process while minimizing exposure of employees and the public to hazards associated with the work. Consider the following items when planning the site layout and controls. Check the description of the site controls **already** in place:

☐ Work area is within a facility/property with secure and restricted access provided by client or third party

☐ Work area is enclosed within a facility/property, but access is not restricted via locks, guards, or gates

☐ Work area is on a property that is open, but access by the public is unlikely

☒ Work area is on a property that is open and access by the public is likely

☐ Work area is in a roadway or right of way of a roadway (Traffic Control/Protection Plan required S3AM-306-PR1)

☐ Work area is in a parking lot or driveway

☐ Work area is on or near railroad, including right of way, active lines and crossings

☐ Other: N/A

Consider the following items when planning the site layout and controls:

- "Line of Fire" hazards- overhead utilities, falling/ tipping equipment, release of energy/ pressure, flying debris
- Noise, dust, odor suppression
- Contamination containment and decontamination area layout
- Traffic control for site vehicles/ equipment (public traffic control requires Traffic Control Plan)
- Restricted access for areas requiring special training, skills, or certifications
- Restriction of work near railroads
- Presence or creation of excavations
- Loading/unloading areas
- Portable restrooms
- Dumpsters and bins
- Equipment lay down
- Heavy equipment parking
- Overnight safety and security needs

Check and describe the site controls that need to be added to protect the public and the AECOM work team.

Control Item	Description of Type and Application
☐ **Fence**	N/A
☐ **Locks**	N/A
☐ **Barricades**	N/A
☒ **Cones**	Cones will be used when there is potential need for traffic control, such as work on crushed stone access road on Star Gas Products property or asphalt access road/parking lot on MHBP Treatment Area property.
☐ **Tape**	N/A

☐ **Hole Covers**	N/A
☐ **Other:**	N/A

6.2 Simultaneous Operations

Simultaneous and neighboring operations, including activities performed by the general public, our clients, and other workers or contractors working near our employees, often present a need for added co-ordination and communication to address hazards that are presented by multiple operations.

Simultaneous Operations – Within the Site

☒ Yes, see table below for details
☐ None, not applicable

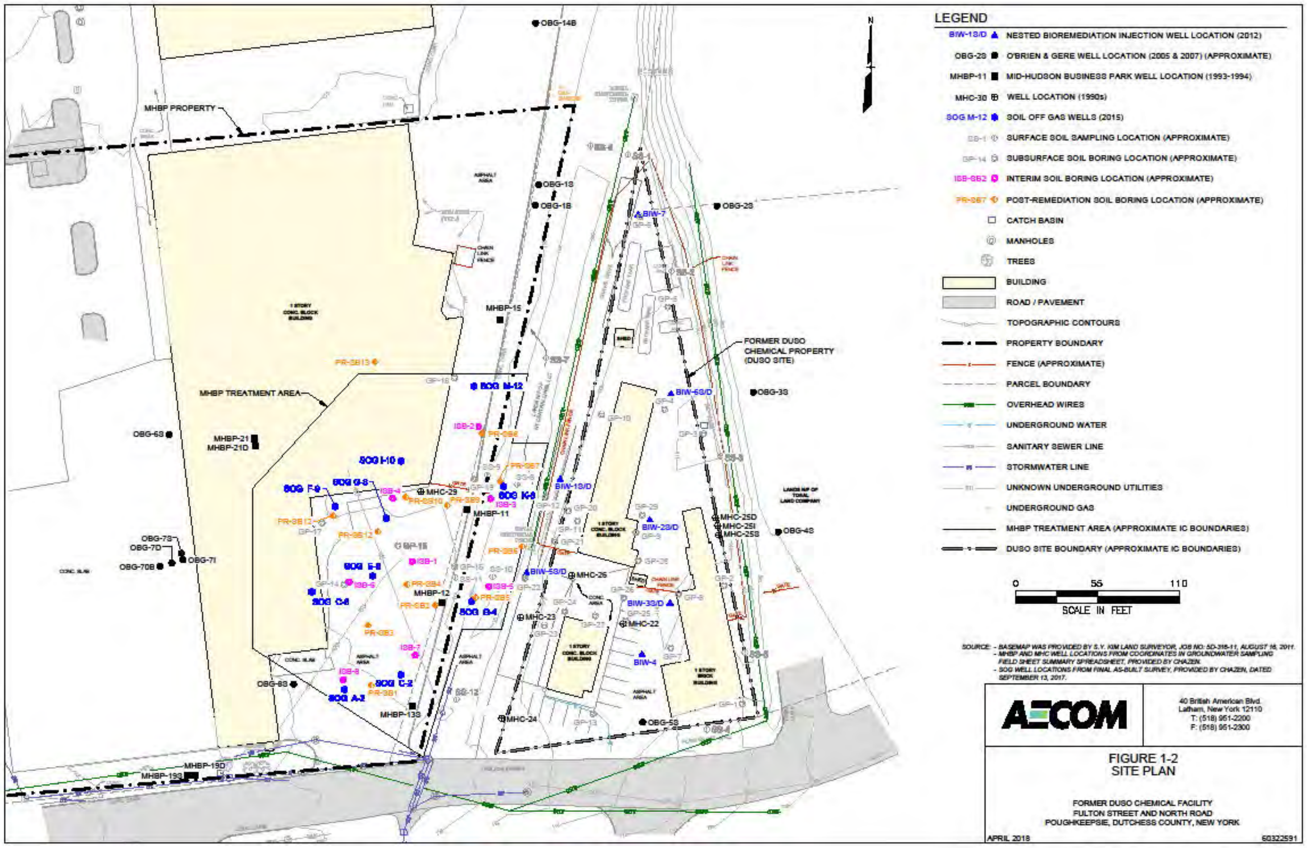
Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)	
Propane storage and distributor	Star Gas Products	Rich Muellerlelie rich@stargasproducts.com	(845) 452-8400	☒ Yes	☐ No
Property Owner	Mid-Hudson Business Park	Avrohom Schlaff adschlaff@shlagro.com		☐ Yes	☒ No
				☐ Yes	☐ No

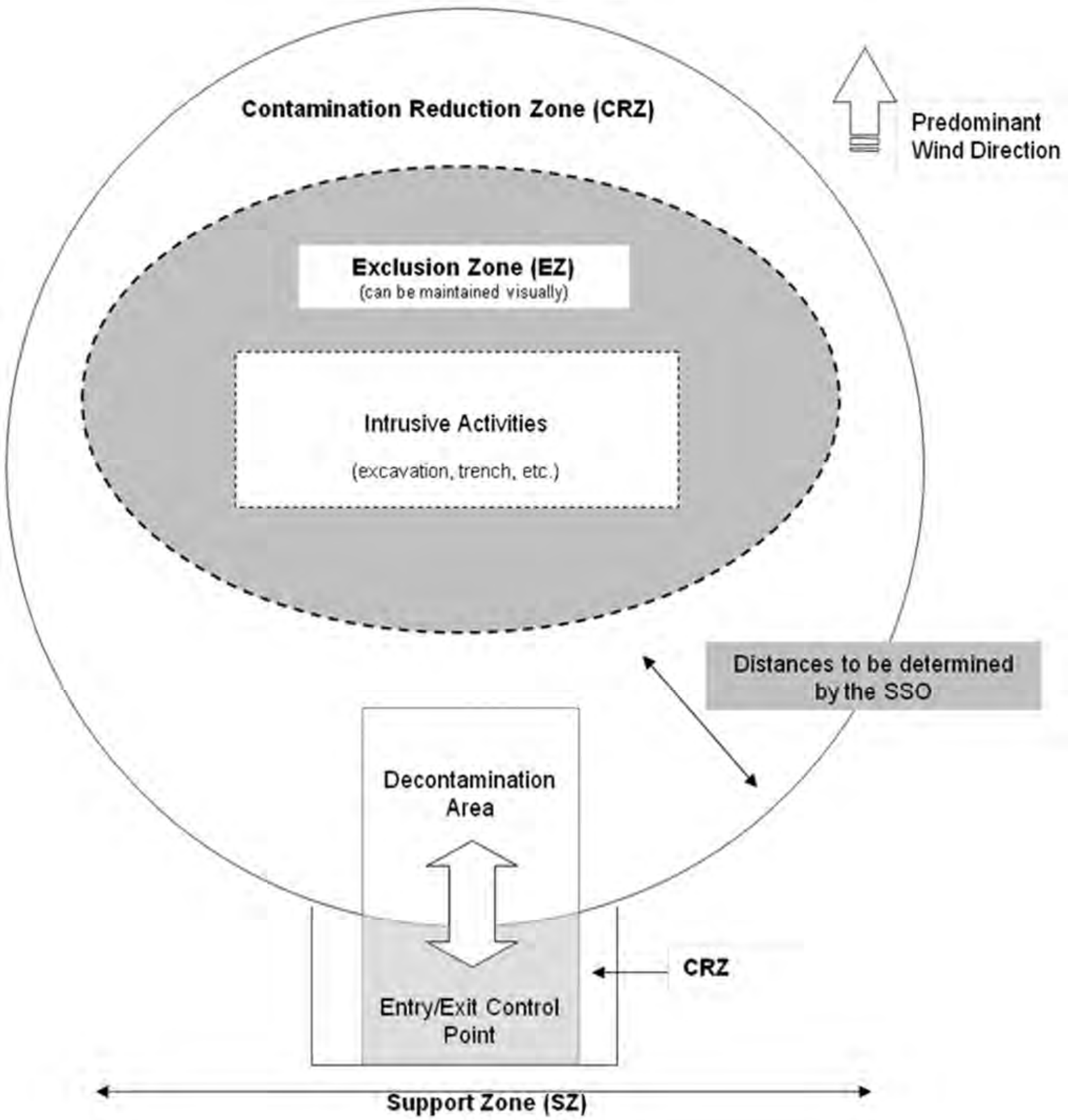
Simultaneous Operations – Neighboring Sites

☐ Yes, see table below for details
☐ None, not applicable

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)	
				☐ Yes	☐ No
				☐ Yes	☐ No
				☐ Yes	☐ No

6.3 Site Control Maps/Diagrams




Contamination Reduction Zone (CRZ)
Predominant Wind Direction
Exclusion Zone (EZ)
(can be maintained visually)
Intrusive Activities
(excavation, trench, etc.)
Distances to be determined by the SSO
Decontamination Area
CRZ
Entry/Exit Control Point
Support Zone (SZ)

6.4 Lone Worker

AECOM discourages employees from working alone (i.e., where AECOM personnel are out of visual and audio range of others) when performing field tasks (see Working Alone SHE Procedure S3AM-314-PR). If lone work is to be performed, a communications/check-in plan must be developed and implemented using the table below.

Lone Worker:	Lone worker situations are not anticipated to occur while carrying out the above scope of work.
Justification:	N/A
Check-In Requirement:	N/A
Check-In Contact:	N/A
Hazard Summary:	N/A
Response Plan:	N/A

7. Emergency Contact Information

For more information on emergency management, see the Emergency Contact Information in this HASP Summary.

7.1 Emergency Management

7.1.1 Emergency Response Plan

A Project Emergency Response Plan must be developed by the AECOM Project Manager for its staff as per the project location like remote areas, industrial areas, city areas, etc. This plan and any alterations to this plan will be communicated to all AECOM project staff, subcontractors and visitors. Depending on the duration of the project, AECOM shall perform mock drills accordingly.

Subcontractors will provide their own Project Emergency Plan to AECOM for review and acceptance. Any alterations to this plan must be communicated to all parties. Both AECOM and the subcontractor shall perform mock drills periodically in accordance with the length of the project.

Refer to the **AECOM Project Emergency Response Plan (Attachment I)**. For additional information on Emergency Response Planning, please review the Emergency Response Planning procedure, S3AM-010-PR1.

7.1.2 Emergency Planning

AECOM requires that all projects, plan for reasonably foreseeable emergencies. Prior to the start of site mobilization, all AECOM personnel shall review the site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures.

8. Personal Protective Equipment

The use of Personal Protective Equipment (PPE) forms the final barrier of protection between the employee and the hazard and applies to all employees at the work site, including Subcontractors, visitors and client or customer representatives. For additional information on PPE, please review the Personal Protective Equipment, S3AM-208-PR1.

The minimum PPE required on an AECOM project is as follows: hard hat, safety toe boots, high visibility vest, safety glasses, long pants and shirts with sleeves that cover the shoulders. If any materials are to be handled, then gloves shall be worn as well.

Specific PPE shall also be specified in Task Hazard Analyses (THAs) such as glove type (i.e. material, level of protection, etc.). Where possible, hazards will be eliminated or controlled to reduce the risk associated with a specific task.

These controls include:

- Elimination of the hazard
- Isolation of the hazard
- Engineering Controls
- Administrative Controls

With the exception of prescription safety eyewear and safety toed boots (there may be allowances for the purchase of these items), AECOM will make available all required PPE for its employees. All employees will receive training in the use, care, maintenance and storage of the PPE issued to them.

All personal protective equipment will meet the requirements of local, state, federal, client and AECOM SH&E regulations and procedures. Where site-specific PPE requirements exist, all AECOM employees, Subcontractors and visitors, who work on the Project, will follow those requirements.

PPE will **not** be modified or changed.

All PPE that is damaged or in need of service or repair will be removed from service immediately.

All PPE that has been removed from service will be tagged "OUT OF SERVICE" and will not be returned until repaired and inspected by a qualified person. Defective PPE must be removed from site to prevent it from being used.

8.1 SH&E Technology

At AECOM, we encourage the use of new technology to eliminate or reduce the risk our employees are exposed to. Mark the technology you will be using in this project (if any):

- ☐ **Wearable Technology/Smart PPEs** (e.g. clothes, helmets, glasses, harness)
- ☐ **Ergonomics Technology** (e.g. tracking or managing ergonomics data, use of technology to make a task safer ergonomically)
- ☐ **Site Sensors** (e.g. Movement, angle, noise, carbon monoxide, Dust)
- ☐ **Fatigue Monitoring**
- ☐ **Vehicle related Technology** (e.g. Telematics, Driver Training, backing cameras/sensors, collision avoidance)
- ☐ **Phone/Tablet Applications** or software:

☐ **Connected Worksites** (i.e., connection between employees or project elements to be successful)

☐ **Drones**

☐ **Virtual Reality (VR) or Augmented Reality (AR)**

☐ **GPS** – Location devices:

☐ **Radio Frequency Identification** (RFID)

☐ **Autonomous Equipment**

☐ **Other:**

☑ **None of these:** We will not use any technology in this project to reduce hazards

Find available tools and/or share the tools you will be using in the AECOM Technology Toolbox or let us know what would be interesting to assess by **clicking here**.

9. Safety, Health and Environment Program

9.1 AECOM SH&E Policy

AECOM's Safety, Health and Environment Policy, which establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance in the interest of benefitting AECOM's employees and stakeholder in the global marketplace, is available on AECOM's Ecosystem (intranet).

9.2 Safety for Life

"Safety for Life" is a comprehensive integrated AECOM Safety Management System that drives our employees toward AECOM's commitment to achieving zero work-related injuries and/or illnesses; preventing damage to property and the environment; and maintaining an environmentally friendly and sustainable workplace. Our Safety for Life program is supported by nine Life Preserving Principles that apply to all AECOM activities.

9.3 Life Preserving Principles

AECOM has adopted these "Life-Preserving Principles" to help demonstrate the commitment of our Safety for Life program. We firmly believe these "Life-Preserving Principles" will enable AECOM to achieve its goal of zero employee injuries, property damage and an environmentally friendly and sustainable workplace. The nine Life-Preserving Principles, along with their descriptions, can be found on AECOM's Ecosystem (intranet).

Commitment: Managers will lead on safety, continuously demonstrating commitment to the highest standards.	Recognition and Rewards: Employees are rewarded for safety excellence and we share best practices..
Participation: All employees are encouraged to engage in helping to control the risks we face.	Orientation and Training: Our employees will be provided with effective safety training in order to identify and mitigate hazards in the workplace to prevent injuries to themselves and others who may be affected by their actions.
Budgeting and Staffing for Safety: The costs of managing SH&E are budgeted into every project. Our safety staff are fully trained to provide expert guidance.	Incident Investigation: We investigate recordable incidents and serious near misses to understand the causes and take action to prevent recurrence.
Pre-planning: We assess risks and produce detailed plans to control them during design, planning, and execution of work.	Fit for Duty: All staff come to work each day fit and well, so they do not pose a hazard to themselves or others.
Contractor Management: We carefully select and collaborate with all our partners to create a safe working environment.	

9.4 Fitness for Duty

One of AECOM's nine Life-Preserving Principles is Fitness for Duty (see Fitness for Duty procedure (S3AM-008-PR1). Fitness for Duty means that individuals are in a state (physical, mental, and emotional) that enables them to perform assignments competently and in a manner that does not threaten the health and safety of themselves or others. On certain projects or for specific tasks, fit for duty certifications may be requested of medical providers by SH&E Managers or Human Resources (HR). Employees should ensure they are fit for duty prior to leaving home and unimpaired by substances or fatigue, and if necessary, contact your supervisor rather than attempting to report to work in unfit condition. Supervisors must observe their employees and work with the employee, SH&E staff, and HR to address deficiencies. AECOM will **NOT** tolerate retaliation against any employee for filing a complaint or concern regarding their fitness for duty or participating in any way in an investigation.

9.5 Proactive Health

AECOM is committed to promoting proactive health activities in addition to the planning for prevention of safety and environmental incidents. Proactive health activities will be completed on an on-going basis at AECOM on a corporate-wide basis (i.e., the wellness program associated with employee benefits), at offices, and at this project site. Management will be actively involved in providing and encouraging opportunities for health and wellness education and improvement. Health initiatives and education will be discussed periodically during office-based meetings as the safety moment or during the daily tailgate meeting as a toolbox talk. Topics may be related to, but are not limited to, the following:

- ✓ Heart health
- ✓ Stress management
- ✓ Smoking cessation
- ✓ Diabetes prevention
- ✓ Diet
- ✓ Exercise benefits

Topics and educational materials can be located on the AECOM Wellness page, National Institutes of Health website, Centers for Disease Control and Prevention website, and other reputable sources online.

In addition, the field team will be encouraged to participate in a daily stretch and flex routine (a standardized way to avoid soft tissue damage from work activities) to the best of their abilities, given their own personal limits. It is particularly beneficial to warm and loosen muscles before repetitive work, manual handling of loads, and when working in cold temperatures or with static postures. The Stretch and Flex manual and poster (**Attachment E**) serve as guidance for the leader to follow.

9.6 Fatigue

One aspect of fit for duty is fatigue management. AECOM has developed procedures that limit work periods or requires additional rest under certain circumstances, including during long-distance travel or when working at high altitudes. These procedures also set limits on extended work periods of 14 hours per day or 60 hours per week. A fatigue management plan is required if longer working hours are necessary (see Fatigue Management Procedure S3AM-009-PR1).

9.7 Driving and Vehicle Safety

The proper operation of vehicles is critical to protecting the safety of AECOM employees and subcontractors. Drivers face numerous hazards while operating vehicles. Some of the hazards include collision with another vehicle, collision with a fixed object, vehicle break down or failure, or falling asleep or becoming otherwise incapacitated while driving. All employees will adhere to Driving procedure S3AM-005-PR, which includes the following key practices:

1. Authorized Drivers
   Managers must authorize drivers following evaluation of driver criteria to drive and maintain an AECOM-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting AECOM business.

2. Electronic Devices Prohibited
   AECOM prohibits use of all portable electronic devices while operating a motor vehicle/ equipment, which includes being stopped at a traffic light or stop sign. Electronic devices include, but are not limited to, all mobile phones, two-way radios, pagers, iPods, MP3s, GPS, DVD players, tablets laptops, and other portable electronic devices that can cause driver distraction. Hands-free device use is **NOT** allowed.

   - GPS units and devices used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road. Electronic devices shall be setup for operation prior to commencing driving activities and shall NOT be changed by the driver while driving.

3. **Vehicle Inspections**
   The driver shall conduct pre-trip vehicle inspections prior to each trip. A vehicle inspection checklist, S3AM-005-FM2, can be used to guide and document the inspection process. Vehicle inspection is to include a 360-degree walk around and visual inspection under the vehicle for leaks and obstructions prior to moving the vehicle.

4. **Training**
   All drivers shall complete defensive driver training. Additional training (i.e., hands-on defensive driver training) may apply for medium and high-risk drivers; see Driving procedure S3AM-005-PR and SHE Training procedure S3AM-003-PR for more details.

5. **Journey Management Plan**
   Drivers who undertake trips in excess of 250 miles (400 kilometers) one way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a Journey Management Plan using S3AM-005-FM1 or equivalent.

6. **Secure Loads**
   Cargo is only to be carried within the passenger compartment of a vehicle when segregated and restrained to prevent objects from becoming distractions, obstructions, or projectiles to occupants should emergency vehicle maneuvers be required (e.g., harsh braking or crash). All goods transported on flatbed trucks or in pickup beds must be securely fastened to prevent them from becoming hazards. All applicable laws and regulations regarding securing of loads must be met. It is prudent to check the load after a few miles to ensure that load has not shifted or loosened prior to completing the remainder of the trip.

9.8 Fatigue and Driving Safety

The effect of fatigue is both physiological and psychological and can severely impair a driver's judgement. Fatigue can cause lapses in concentration which could prove fatal. Fatigue is not just a problem for drivers on long trips, as drivers can also suffer from fatigue on short trips.

- ✓ After strenuous fieldwork, consider overnight accommodation or vehicle sharing for staff who are not acclimatized to the type of work.
- ✓ Microsleep can occur with a limited warning, and may be linked to several factors, for example:
  - Microsleep is most likely to occur during times when the circadian rhythm dictates the body should be asleep, such as at dawn, late at night, or in the mid-afternoon (e.g., 1 and 4 am and 1 and 4 pm.).
  - Potential to feel drowsy after a meal.
  - Driving long distances (considered potentially monotonous) even with sufficient sleep.
  - Prolonged sitting and warm ambient temperature may also increase the feeling of sleepiness.
- ✓ If safe to do so, consider undertaking actions to disrupt the microsleep event while identifying a safe place to stop, e.g., open a vehicle window, listen to upbeat music/change music source or ask the passenger (if present) to engage in conversation.
- ✓ Ensure field staff are familiar with the signs of fatigue and mitigation factors.

The most common visible signs of microsleep include the following:

- Eyelid drooping
- Eyelid closure
- Head nodding
- Brief periods of snoring
- Wandering thoughts

If any of the above become apparent, immediately pull over to a safe location and contact your PM or SH&E representative.

9.9 Hand Safety

The hands are exposed to hazards more than any body part. SH&E Hand Safety Procedure S3AM-317-PR describes requirements and best practices including these notable practices:

- **All personnel shall have gloves in their immediate possession 100%** of the time when in a shop or on a work site. Gloves that address the hazard shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc. Use the Gloves Needs Assessment (S3AM-317-FM1) to help determine the appropriate glove for the hazard(s).
- **Fixed open-blade knives are prohibited** from use during the course of AECOM work. Examples of fixed open-blade knives include pocket-knives, multi-tools, hunting knives, and standard utility knives. For more information about cutting tools, see S3AM-317-ATT1 Safe Alternative Tools.

9.10 Substance Abuse

Drug and alcohol abuse pose a serious threat to the health and safety of employees, clients, and the general public as well as the security of our job sites, equipment and facilities. AECOM is committed to the elimination of illegal drug use and alcohol abuse in its workplace and regards any misuse of drugs or alcohol by employees to be unacceptable. AECOM Substance Abuse Prevention Procedure (S3AM-019-PR1) prohibits the use, possession, presence in the body, manufacture, concealment, transportation, promotion or sale of the following items or substances on company premises. Company premises refer to all property, offices, facilities, land, buildings, structures, fixtures, installations, aircraft, automobiles, vessels, trucks and all other vehicles and equipment - whether owned, leased, or used.

- Illegal drugs (or their metabolites), designer and synthetic drugs, mood or mind altering substances, and drug use related paraphernalia unless authorized for administering currently prescribed medication;
- Controlled substances that are not used in accordance with physician instructions or non-prescribed controlled substances; and
- Alcoholic beverages while at work or while on any customer- or AECOM-controlled property.

This policy does not prohibit lawful use and possession of current medication prescribed in the employee’s name or over-the-counter medications. Employees must consult with their health care provider about any prescribed medication’s effect on their ability to perform work safely and disclose any restrictions to their supervisor.

Although some states may pass laws legalizing medical or recreational marijuana use, the use, sale, distribution and possession of marijuana are violations of federal law and AECOM policy, and will subject an employee to disciplinary action up to and including termination in accordance with controlling law. In Canada, where medical and recreational marijuana use is legal, employees must still follow Federal and Provincial laws, and AECOM policy with regards to use and possession. Employees found to be in contravention of legal requirements or AECOM policy will be subject to disciplinary action up to and including termination.

9.11 Rewards and Recognition

One of AECOM’s Life Preserving Principles is Recognition and Rewards for proactive safety, health and environmentally focused behaviors. All projects are expected to participate in the rewards and recognition programs available on the Corporate and DCS Americas SH&E ecosystem pages. Large, long term projects are encouraged to establish a project specific rewards and recognition program which incorporates project specific goals and activities (template available S3AM-020-FM1). ***All rewards and recognition programs must emphasize the 9 Life Preserving Principles and proactive SH&E activities NOT solely the achievement of lagging metrics (“injury/incident-free” hours, etc.) as those may discourage incident reporting.***

There are several possible appropriate methods of rewarding and recognizing employees and contractors:

1. **Informal** – recognition via verbal acknowledgement, email, spot awards, luncheons, etc.

2. **Formal** – recognition via DCS Americas Programs:
   - AECOM Safety Star Recognition Program
   - AECOM Making a Difference (MAD) Award
   - Executive Challenge Coins

9.12 Stop Work Authority

AECOM empowers and expects all employees to exercise their Stop Work Authority (see Stop Work Authority Procedure (S3AM-002-PR1) if an incident appears imminent, or when hazardous behaviors or conditions are observed. A stop work request can be informal if the situation can be easily corrected or may require shutting down operations if revised procedures are necessary to mitigate the hazard. If an AECOM employee observes an imminently hazardous situation on a site controlled by others (i.e., a client-managed contractor), the employee can always stop work for themselves by removing themselves from the situation. Employees also may attempt to stop work to avoid allowing the contractor to come to harm by immediately notifying the contractor foreman or site engineer, or if necessary, the client or party managing the contractor.

No employee should object to the issuance of a stop-work request, nor can any disciplinary action be levied against the employee. All employees must agree that the situation has been mitigated before resuming work. No employee will be disciplined for refusing to work if they feel it is unsafe.

10. Roles and Responsibilities

10.1 AECOM Project Manager

The Project Manager (PM) has overall management authority and responsibility for all site operations, including safety. The PM will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations. Some of the PM's specific responsibilities include:

- Develop a defined scope of work and project schedule with clear objectives and reasonable milestones.
- Budget and allocate the appropriate resources to safely and efficiently complete the work, including technical, safety and quality reviews.
- Prepare a project risk register to support project planning and risk management.
- Identify requirements and expectations applicable to the scope of work, site access, client and host facility.
- Assemble qualified project and field teams, including subcontractors, with the appropriate training, education and experience.
- Ensure subcontractors are approved in subport and obtain variances for those that have been conditionally approved.
- Review and approve the AECOM safe work plan (SWP) or health and safety plan (HASP) and task hazard assessments (THAs).
- Obtain and review subcontractor SWP/HASP and THAs or equivalent task risk assessment documents.
- Conduct a project kick-off meeting to convey information, requirements, and expectations to the field team.
- Ensure the field team has all the tools, equipment, instruments, and supplies, including PPE, to perform the work safely.
- Coordinate field activities with the client and/or host facility.
- Be visible to and maintain regular communication with the field team.
- Verify that technical, safety, and quality reviews are completed as planned.
- Verify that AECOM's SH&E policies and procedures are fully implemented.
- Coordinate the management of changes identified by the field team.
- Address and correct unsafe acts/behaviors and conditions.
- Confirm observation, near miss and incident notification and reporting are completed internally, to site and client, as required.
- Conduct a post project review.
- Lead by example – walk the talk.

10.2 AECOM Site Supervisor

The Site Supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans and HASP. The Project Manager may act as the Site Supervisor while on site. The Site Supervisor's responsibilities include:

- Verify the personnel, equipment/machinery and instruments anticipated to mobilize to site.
- Communicate project roles and responsibilities.
- Discuss planned activities for the day and any potential simultaneous operations (SIMOPs).
- Establish staging and work areas for planned activities.
- Confirm crews have reviewed and updated, as necessary, task hazard assessments prior to beginning the task.

- Coordinate and document project activities.
- Monitor for deviations and changes in scope, personnel, methods, materials, equipment/machinery, instrumentation, and site conditions.
- Notify the AECOM project manager of changes and coordinate change management.
- Escort or delegate the escorting of site visitors.
- Serve as AECOM's point of contact with the host facility and person-in-charge for simultaneous operations (SIMOPs).
- Delegate stop work authority to all project employees and report all unsafe acts/behaviors and conditions, near misses and incidents to the AECOM project manager.
- Lead by example – walk the talk.

10.3 AECOM Site Safety Officer

The Site Safety Officer supports the Site Supervisor in providing a safe work environment. Not all sites will have a designated Site Safety Officer; the decision should be made by the Project Manager and SH&E Manager taking into consideration the complexity and risks of the scope of work. The Site Supervisor may act as the Site Safety Officer on sites without one. The Site Safety Officer's responsibilities include:

- Conduct the site safety orientation for the entire field team, including subcontractors, and site visitors.
- Lead the tailgate safety meeting.
- Discuss hazards present at the site and/or within environmental media and their control measures.
- Communicate air monitoring methods and action levels.
- Explain emergency response and reporting procedures, including emergency contacts and muster and shelter-in-place locations.
- Establish exclusion and contamination reduction zones, as needed.
- Verify SWP/HASP, THA and safety requirements and expectations are being met.
- Confirm hazard control measures are in-place and effective.
- Perform housekeeping and site inspections to ensure a safe working environment.
- Engage outside safety, health & environment resources, as needed, to allow for the safe performance of the work.
- Assist in incident investigations and identification and implementation of corrective actions.
- Lead by example – walk the talk.

10.4 AECOM SH&E Manager

Responsibilities of the SH&E manager is to:

- Promote the AECOM Safety for Life Program and our Nine Life Preserving Principles.
- Understand the application of SH&E regulatory requirements relevant to SH&E in the company's operations and be aware of changes in regulations which may affect the company.
- Be formally trained, licensed or certified where the regulations require.
- Assist with the budgeting and staffing process to ensure project teams have the knowledge and resources needed to perform their work safely.
- Be aware of all incidents, near misses, observations, unsafe acts and unsafe conditions that are reported and participate in the investigation process where required.
- Verify incidents are reported to regulatory bodies in accordance with local legislation.
- Review investigation findings to confirm identified corrective actions are appropriate and subsequently implemented.

- Review and accept site-specific SH&E Plans and Task Hazard Analyses (THAs).
- Assist in the preparation of risk assessments.
- Assist in the review of SH&E training needs.
- Verify necessary training as required by AECOM policies and procedures and/or the regulations.
- Assist in the setting of SH&E expectations at project level and review them periodically.
- Perform project SH&E audits on a periodic basis.
- Monitor the corrective actions taken, where audits identify non-conformance or opportunities for improvement, for confirmation of their completion and effectiveness.
- Lead by example, walk the talk.

10.5 AECOM Employees

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

- Arrive onsite fit for duty and dressed for weather conditions.
- Actively participate in tailgate safety meetings and crew THA reviews.
- Perform only assigned tasks consistent with training & competency.
- Follow SWP/HASP, THA and safety requirements & control measures.
- Use 4-sight as a last-minute risk assessment tool.
- Notify the AECOM site supervisor prior to any deviation from the planned activity (i.e., change in personnel, methods, materials, equipment, etc.).
- Use stop work authority and report all unsafe acts/behaviors and conditions, near misses and incidents to the AECOM site supervisor.
- Always conduct yourself in a professional and ethical manner.

10.6 Visitors

Authorized visitors (e.g., client representatives, regulators, AECOM management staff, etc.) requiring entry to any work location on the site will be briefed by the Project Manager, Site Supervisor, or Site Safety Officer on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and PPE that are required for entry to any controlled work area; visitors must comply with these requirements at all times.

If the site visitor requires entry to any exclusion zone (EZ), but does not comply with the above requirements, the visitor will be denied access to the EZ. If the visitor disregards instructions to remain outside the EZ, work activities will be immediately suspended, and the situation reported and documented.

Unauthorized visitors, and visitors not meeting the specified qualifications, will **NOT** be permitted within established controlled work areas. If unauthorized visitors and/or visitors not meeting the specified qualifications enter a controlled work area and/or EZ, work activities will be immediately suspended, and the situation reported and documented.

11. Subcontractor Management

11.1 AECOM Roles/Responsibilities for Sub Management

When managing an AECOM Subcontractor of any tier, AECOM management and supervision will follow the requirements in S3AM-213-PR1 and are responsible for the following:

- Direct all activities of the facility, site, or project location.
- Ensure appropriate training and experience of AECOM personnel responsible for overseeing subcontractor work.
- Verify subcontractors have the appropriate trained and competent personnel to perform their activities in a safe, healthful, and environmentally responsible manner.
- Pre-qualification of Subcontractor – Prior to performing work on an AECOM project, management and supervision must verify the Subcontractor has been pre-qualified. AECOM's preferred method of prequalification is Subport, but there are other ways to prequalify a subcontractor.
- Ensure all subcontractor employees attend the AECOM daily tailgate safety meeting.
- If you have any questions about subcontractor pre-qualification, reach out to an AECOM SH&E professional.

11.2 Subcontractor Roles/Responsibilities for Safety

Subcontractors must provide AECOM with a designated Subcontractor Safety Representative (SSR). Their responsibilities are as follows:

- Direct employees' means and methods of work and how to work safely.
- Be knowledgeable of and understand the safety requirements of the subcontractor's activities.
- Staff the project with employees that are trained and knowledgeable of the tasks they will be performing.
- Have the ability to recognize hazards and the authority to take prompt corrective actions.
- Implement the subcontractor safety program.
- Serve as the direct contact with AECOM regarding resolution of SH&E issues.
- Immediately report all work-related injuries/illnesses/incidents, environmental incidents and regulatory inspections/violations to AECOM according to AECOM procedures and/or client requirements.

11.3 Subcontractor HASP/THAs

If the subcontractor's scope of work includes hazards that are not covered by the AECOM Health and Safety Plan (HASP), the subcontractor will need to provide AECOM with their site-specific HASP and task-specific Task Hazard Analyses (THAs). All subcontractor procedures must at a minimum comply with client and AECOM requirements to ensure that hazards associated with the performance of their work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior mobilization to the site.

12. Training and Documentation

The following sections describe the standard practices or programs that AECOM will establish to prepare employees to perform work safely and consistent with AECOM policy and Procedures. For additional information on SH&E Training, review the Safety, Health and Environment Training, S3AM-003-PR1.

12.1 HASP/Site Safety Orientation

The Project Manager shall conduct a project/site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, Site Safety Officer, or Site Supervisor. This meeting will involve representatives from all organizations with a direct contractual relationship with AECOM on the job site. Minimum items to be covered are listed in **Attachment F**. Participants will then sign the HASP Personnel Acknowledgement register at the end of the HASP.

12.2 Worker Training and Qualifications

All personnel at this site must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure S3AM-003-PR1 establishes the general training requirements for AECOM employees.

See **Section 5.1** of this HASP for site-specific required safety training and documentation.

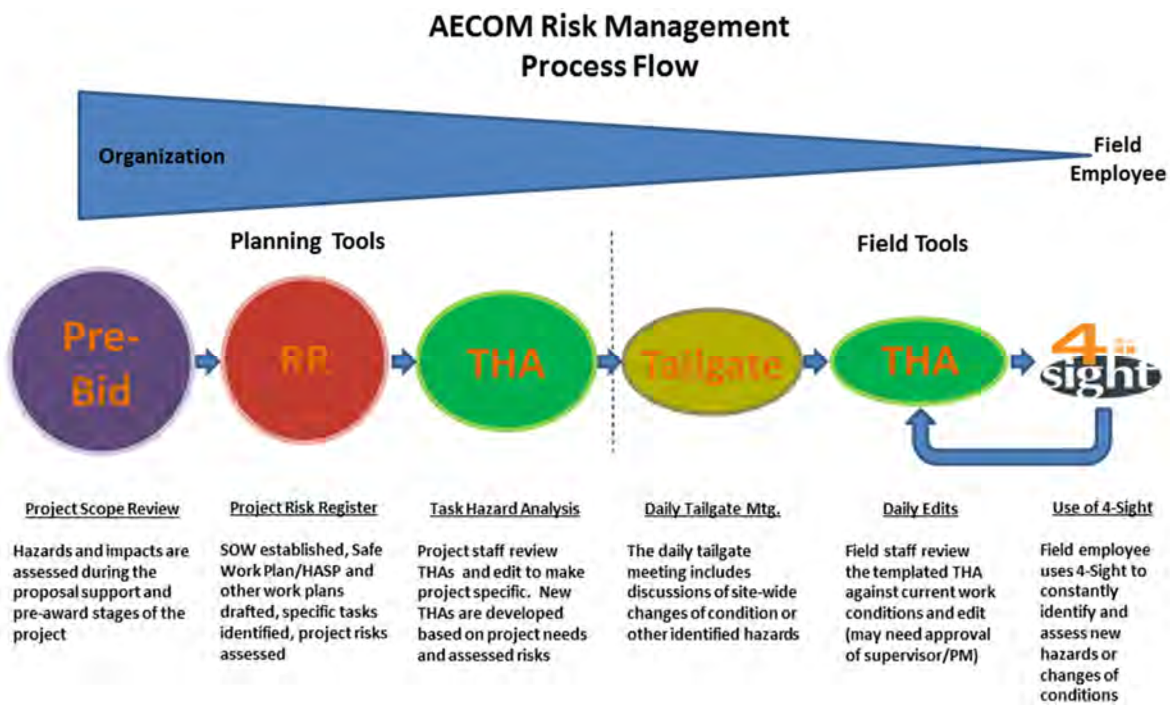
12.3 Competent Person(s)

A competent person is an employee who, through education, training, and experience, has knowledge of applicable regulatory requirements, is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

AECOM's Competent Person Designation Procedure, S3AM-202-PR1, explains the roles, responsibilities and procedures of naming a competent person. Review **Attachment L** of this HASP for a list of site-specific competent person(s) required for this scope of work.

13. Hazard Assessment and Control

AECOM has adopted an approach to hazard assessment and control that incorporates both qualitative and quantitative methods to identify hazards and the degree to which they may impact employees and AECOM operations. See S3AM-209-PR1, Risk Assessment and Management, for details regarding AECOM's process. This approach is illustrated below and described in the following section.



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13.1 SH&E Procedures

All AECOM SH&E procedures, in their controlled copy version, are available on the internal SH&E Policy and Procedures ecosystem page. Programmatic procedures referenced in this document (for example SH&E Training) do no need to be printed for inclusion in this HASP. The applicable field procedures checklist is in the Physical Hazards section below and procedures are included in **Attachment D**.

13.2 Task Hazard Assessments and Daily Tailgate Meetings

THA forms (a blank version is located in S3AM-209-PR1) shall be prepared for each task to be performed as part of the scope of work. This includes driving to the site, parking, and walking as well as the hazards, associated risk, and appropriate controls for all other work activities. The DCS Americas Templated THA Library may also be used to find previously approved THAs, though these should be modified to be project and site-specific. The preparer shall have one THA form for each task in the Scope of Work found in this work plan (**Attachment C**) and shall also include blank copies.

In the field, all employees and visitors shall review the daily THAs and conduct and attend the daily tailgate meeting. When employees arrive on site, conditions may be different than originally planned or additional job steps may be required. The THA requires workers to update or 'dirty up' the THA in the 'On-Site Edits' rows to assess the risks presented by the changed condition(s) and requires the worker to describe steps to reduce the risk. If the hazard(s) cannot be successfully mitigated, the work will **NOT** proceed.

A Site Safety Officer (SSO) or field supervisor shall conduct a daily tailgate meeting to review the specific requirements of this HASP prior to the commencement of daily project activities. Attendance at the daily tailgate meeting is mandatory for all employees and subcontractors at the site covered by this HASP. Simultaneous operations are encouraged to attend each other's tailgate meetings or at the very least the supervisors shall discuss the coordination of activities and associated hazards of each other's tasks. The tailgate meeting must be documented by the field Supervisor or SSO, using the New Daily Tailgate Meeting App. Use the appropriate QR code to download the App and/or go to the Daily Tailgate Meeting App Ecosystem page for details, guides, training sessions and/or other information:

iOS

Android

As an alternative you can also use or the Daily Tailgate Meeting form (S3AM-209-FM5), a blank copy of which is included in **Attachment C**.

13.3 Hazard Categories

THAs should include consideration of the following hazard categories when identifying hazards and task specific controls:

Category	Definition
 Biological	A biological hazard is any living organism that could cause irritation, allergic reaction, bites, stings, illness, infection, or other injury.
 Chemical	A chemical hazard is any chemical substance that could potentially cause harm to humans, equipment, or the environment either through contact, ingestion, absorption, inhalation, or reaction.
 Electrical	Electrical hazards are present whenever there is potential for contact with an electric charge.
 Gravity	Gravitational force can cause tools, equipment, materials, and people to fall either to the same level or from heights to the earth or a lower surface.
 Mechanical	A mechanical hazard when there is energy within the components of a mechanical system within an otherwise stationary piece of equipment/machinery.
 Motion	Objects or substances that can move or are moving not due to gravity create a motion hazard. Motion hazards also include body motions and positioning such as bending, stretching, kneeling, etc.

Category	Definition
	Noise hazards are sounds that may prevent effective communication or cause hearing loss.
	Any physical matter such as gases, liquids, and springs that is compressed or under a vacuum creates a pressure hazard.
	Radiation hazards include both ionizing and non-ionizing energy emitted from radioactive elements or sources.
	Thermal hazards can cause injury or damage due to their temperature.

13.4 4-Sight

When preparing hazard assessments and throughout the day workers should use 4-Sight. This is a mental process through which workers ask themselves (and each other) four questions designed to effectively assess hazards. Using these questions during each task, especially those without established THAs, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.

- What am I about to do?
- What could go wrong?
- What could be done to make it safer?
- What have I done to communicate the hazard?

13.5 Speak Up/Listen Up

All AECOM employees have a responsibility to help create the environment where the expectation is Safety for Life. Speak Up/Listen Up (SULU) is a technique to steward jobsite safety by utilizing 4-Sight as a basis for safety feedback conversations. SULU has two main parts:

- **Speak Up** where employees use three simple steps when providing feedback to others about unsafe acts:
  - Ask to discuss their hazard assessment or 4-Sight for the task;
  - Get a commitment from the employee to apply the hazard controls and perform the task according to the accepted procedures; and
  - Follow up to ensure the employee is working safely
- **Listen Up** where employees use two simple steps when responding to safety feedback:
  - Listen – Focus on the message, not the messenger; and
  - Commit to performing the task the safer way

SULU conversations should happen consistently throughout the workday to create clear expectations of how work should be performed. All employees should recognize safe work behaviors in order to reinforce them and keep them going. An occasional correction is much more effective when employees are frequently encouraged and positively recognized for their safe actions. Managers and supervisors should be having SULU conversations during site visits and ensure peer to peer and site supervisor to crew SULU conversations are being held.

14. Incident Reporting

14.1 Incident Notifications and Reporting

NOTE! In the event of a life-threatening emergency, call 911 FIRST. A life-threatening emergency can include:

- Loss of consciousness
- Head or spinal cord injury
- Cardiac arrest
- Seizures
- Severe allergic reaction
- Broken bones
- Uncontrolled loss of blood
- Abdominal trauma
- Heat Stroke
- Difficulty breathing

Once immediate actions have been taken, if safe to do so, notifications (verbal) must be completed immediately and the involved employee, site supervisor or site safety officer most call the AECOM Incident Reporting Hotline at 1-800-348-5046. Notifications serve to engage additional resources in the management of the emergency and initiate additional processes such as medical case management, spill response, incident investigation, etc. Reporting initiates the formal documentation process and supports the development of key learnings to prevent a reoccurrence.

14.1.1 AECOM Internal Notifications

For any incident or near miss, the involved employee must notify their site supervisor or site safety office. The site supervisor or site safety officer must notify their Project Manager. Depending on the severity of the incident, the Project Manager may need to notify the following individuals:

- Regional, area, business line, practice group or account SH&E manager.
- Program Manager or Client Account Manager
- Senior Leaders

14.1.2 Client Specific Notifications

Notify our clients of incidents in accordance with their incident notification requirements.

See client contact information in the Key Personnel table at the bottom of the **HASP Summary** on Page i.

14.1.3 Incident Investigation

All incidents and near misses will be investigated and documented to determine the contributing and root causes. The investigation will verify the need for corrective actions and identify opportunities for Lessons Learned and continuous improvement. For more information in incident investigations, please review the Incident reporting, Notifications and Investigation procedure, S3AM-004-PR1.

As soon as it is safe to do so after an incident occurs, the following information will be gathered:

- An incident timeline;
- Witness statements;
- Photos of the incident;
- Police reports, if applicable;
- Any additional information that will assist in the investigation; and
- Copies of daily safety documentation and/or field notes.

14.2 Incident and Near Miss Reporting

All incidents and near misses (i.e., incidents without consequences), regardless of type and perceived severity, must be reported in accordance with the Incident Reporting, Notifications and Investigation, S3AM-004-PR1 and entered into **IndustrySafe** (AECOM's SH&E Database) within the timeframes listed below:

Incident Type	IndustrySafe Reporting Timeframe
Significant Incident, including any injury to an AECOM employee or Subcontractor	Within **4 hours**
All Other Incidents	Within **24 Hours**

Note: *Only the basic facts, who, what, when, where and how, are needed to complete the initial IndustrySafe report. SH&E Managers will assist you in updating the report as additional information becomes available.*

Significant incidents include:

- Fatality;
- Amputation;
- Hospitalization for treatment for more than 24 hours (admission);
- Any single event resulting in more than one employee requiring medical treatment or more than one employee being away from work for more than 3 days;
- Any SH&E-related Consent Agreement/Order/Lawsuit or enforcement action seeking more than $10,000 or alleging criminal activity;
- Any spill or release of a hazardous material that is reportable to a regulatory agency;
- Any Notices of Violation resulting from not operating within a regulatory agency permit/license or consent;
- Any incident resulting in property damage expected to exceed $10,000 United States dollars (USD);
- Any security-related incident that could have caused significant harm to an AECOM employee; and/or
- Any near miss event that may have resulted in any of the above consequences, but because of "luck" did not result in harm to persons, property or the environment.

Other incidents include:

- Any injury or illness to an AECOM employee or subcontractor, even if it does not require medical attention, including non-work-related injuries/illnesses that have become significantly aggravated by the work environment;
- An injury to a member of the public or client representative occurring on an AECOM-controlled work site;
- Re-occurring conditions such as back pain or cumulative trauma disorders (e.g., carpal tunnel syndrome);
- Fire, explosion or flash that is not an intended result of a planned event (e.g., remediation process, laboratory procedure);
- Any incident involving company-owned, rented or leased vehicles (including personal vehicles used for company business); and/or
- Any failure to comply with requirements of a regulatory permit issued to AECOM.

14.2.1 Motor Vehicle Incidents

Collisions: All vehicles should be rented through Trip Actions (accessible via Ecosystem) to ensure that AECOM insurance is included in the rental rate. All other insurances should be declined. AECOM's rental vehicle insurance policy for National/Enterprise or Avis can be found on the DCS Americas United States or Canada travel pages. **Drivers MUST print and carry the applicable insurance policy for the rental. For company owned vehicles, drivers MUST also print and carry proof of insurance.**

Breakdowns: If safe to do so, remove the car from the traveled way. To the extent possible, AECOM personnel should **NOT** change flat tires or perform similar repairs.

- For rental vehicles, contact the rental company
- For fleet vehicles, contact **ARI Fleet Management**: **1-800-422-7647**
  - Prompt 1 – Roadside Assistance
  - Prompt 3 – Maintenance Management
- For personal vehicles used on AECOM business, contact an emergency provider.

14.2.2 Safety Observation Reporting

All safety observations must be entered into **IndustrySafe™** **or** **Lifeguard™** (AECOM's SH&E Databases).

14.2.3 SH&E Database Access

Incidents, near misses, and audits/inspections must be entered into **IndustrySafe™**, which is one of AECOM's SH&E Databases. Safety observations may also be entered into **IndustrySafe™** at the AECOM Project Manager's discretion. **IndustrySafe™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. IndustrySafe may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.

↑ Incidents, Near Misses, Audits/Inspections and Safety Observations ↑

Safety observations may also be entered into **Lifeguard™**, which is one of AECOM's SH&E Databases, at the AECOM Project Manager's discretion. **Lifeguard™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. **Lifeguard™** may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.

14.2.4 Reporting Assistance

If your field schedule, access to internet, and/or limited cellular phone coverage have the potential to impact timely incident, near miss, and/or safety observation reporting, please contact your AECOM Project Manager and/or SH&E Manager for assistance.

15. Environmental Management

15.1 Scope

AECOM implements policies and procedures to reduce risk of land and/or water pollution and other environmental concerns during the life of the project. The AECOM Project Manager will ensure compliance with all local, state, federal and client environmental laws and/or regulations. For additional information on Environmental Management, please review the Environmental Compliance procedure, S3AM-204-PR1.

15.2 Roles and Responsibilities

All AECOM staff through the leadership of the AECOM Project Manager are responsible for reducing or eliminating environmental impacts by AECOM personnel. The site supervisor and/or the site safety officer will be immediately notified of any spills, leaks, or other impacts to the ground and/or water, or other environmental emergencies, after emergency respondents have been called, if necessary. The Project Manager will be responsible for making any further notifications as required.

15.3 Staffing and Awareness

AECOM staff will receive relevant awareness training to ensure proper knowledge and training when performing activities with the potential to impact the environment, as well as the requirement of this plan for proper preparedness and response.

15.4 Pollution Prevention

Pollution/impact to the environment could be caused by the following sources:

- Air emissions
- Wastewater
- Hazardous materials
- Solid waste
- Hydrocarbons
- Storm water and sediment/erosion

AECOM will employ prevention and control measures to prevent impacts to the environment. In addition, a spill kit consisting of sorbent socks, pads, shovels and personal protective equipment (PPE) will be maintained on site by AECOM and each subcontractor.

Solid waste will be collected, segregated (recyclable, non-flammable, and flammable) and removed on a regular basis.

16. AECOM Audits and Inspections

The AECOM audit and inspection process establishes the protocol for the assessment the Safety, Health and Environment (SH&E) program and its application, as well as the process to identify and monitor corrective actions. The goal is to minimize risk and enhance operational SH&E performance. For more information on audits and inspections, please review the Compliance Assurance procedure, S3AM-216-PR1.

16.1 Project Manager Self Assessments

AECOM Project Managers will perform quarterly SH&E site audits using the DCSA Project Manager Self-Assessment form (available in IndustrySafe.

16.2 Senior Management Activities (SMAs)

AECOM Senior Managers will perform Senior Management Activity inspections on the projects under their area of responsibility. These SMAs will be entered into Lifeguard.

16.3 Project Safety Reviews (PSRs)

AECOM SH&E Managers will perform periodic Project Safety Reviews on projects in their area of responsibility. These PSRs will be entered into IndustrySafe.

16.4 Site Safety Inspections (OSHA Type)

AECOM Project Managers and SH&E Managers will perform periodic site safety inspections (OSHA type) on projects in their area of responsibility as required. These site safety inspections will be entered into IndustrySafe.

16.5 External Regulatory Inspections

If a regulatory inspector shows up on site, AECOM will follow the requirements in our Regulatory Inspections procedure S3AM-211-PR1.

17. Project Closeout

Completing a project requires procedures to close out Project Contractual and Administrative activities. The closeout process ensures all documentation is finalized and any Contractual Obligations are met. The Project is ready for close-out once it has been accepted by the end user organization. Project close-out is complete after all physical, regulatory, contractual, and financial close-out activities are complete.

17.1 Health and Safety File

The Health and Safety File will normally include:

- Brief description of the work carried out.
- Residual hazards which remain and how they have been dealt with (e.g. surveys, or information on asbestos, contaminated land, water bearing strata, buried services etc.).
- Key structural principles incorporated in the design (e.g. bracing) safe working loads etc.
- Any hazards associated with the materials used.
- Nature, location and markings of significant services including underground cables, gas supplies, firefighting etc.
- Information and 'as built' drawings including safe access to and from confined spaces etc.
- Daily Tailgate Meeting Forms
- Lessons Learned

18. Personal Acknowledgement

By signing below, the undersigned acknowledges that he/she has reviewed the AECOM Health and Safety Plan for the NYSDEC Former Duso Chemical Site and Adjacent Mid-Hudson Business Park site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work and will comply with the provisions contained therein. The employee understands that they are **NOT** to perform any work that they have not been adequately trained for and that they are to stop work if it is unsafe to proceed. Finally, the employee understands to notify the Site Supervisor and the **Incident Hotline at 800-348-5046** for any incident, ***including ANY injury even if no first aid or medical treatment is required.***

Print Name Clearly	Signature	Organization	Date

18.1 Disclaimer

This HASP, and each of its provisions, is applicable only to, and for use only by, AECOM, its affiliates, and its subcontractors. Any use of this Plan by other parties, including, without limitation, third-party contractors on industrial sites or projects where AECOM is providing engineering, construction management, or similar services, without the express written permission of AECOM, will be at that party's sole risk, and AECOM Corporation shall have no responsibility. The existence and use of this Plan by AECOM shall not be deemed an admission or evidence of any acceptance of any safety responsibility by AECOM for other parties unless such responsibility is expressly assumed in writing by AECOM in a specific project contract.

Attachment A

Hospital/Clinic Maps and Incident Reporting Flow Chart

Attachment A: Hospital/Clinic Maps

Occupational Health Service

2070 Route 52, Hopewell Junction, NY 12533
(845) 894-9977

View Business Details

MAP & DIRECTIONS

PRINT

A North Road, Poughkeepsie, NY 12601

B Occupational Health Service, 2070 Ro...

Reverse

Clear All **Get Directions**

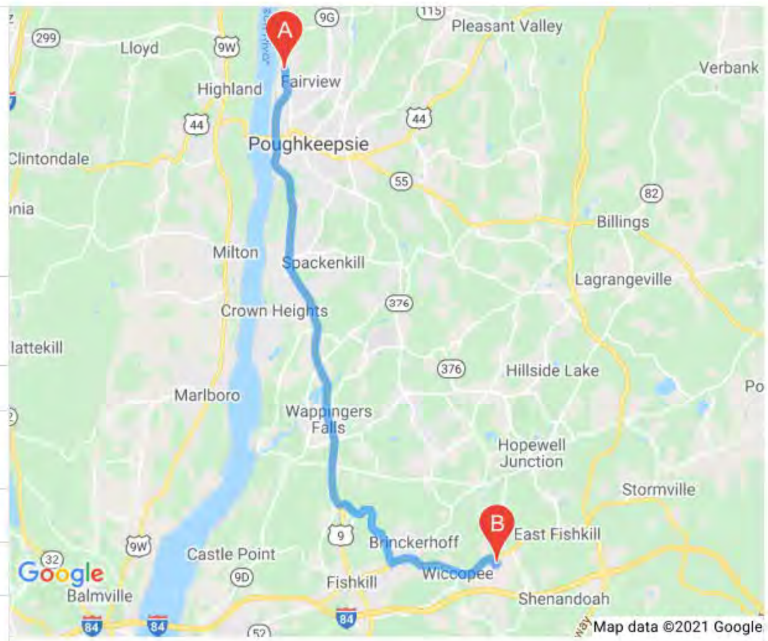
A North Rd, Poughkeepsie, NY 12601, USA

17.8 mi. About 33 mins

1.	Head **south** on **U.S. 9 S** toward **Winslow Gate Rd**	11.9 mi
2.	Turn **left** onto **Smithtown Rd**	1.7 mi
3.	Turn **right** onto **Cedar Hill Rd**	0.9 mi
4.	Turn **left** onto **NY-52**	0.5 mi
5.	Keep **right** to continue on **NY-52 E**	2.4 mi
6.	Turn **right** onto **West Dr**	0.2 mi
7.	Turn **left** onto **North Dr**	253 ft
8.	Slight **right** onto **Administration Ct** Destination will be on the right	443 ft

B 2070 NY-52, Hopewell Junction, NY 12533, USA

Map data ©2021



MidHudson Regional Hospital of Westchester Medical Center

241 North Rd, Poughkeepsie, NY 12601
(845) 483-5000

View Business Details

MAP & DIRECTIONS

PRINT

A Fulton Street, Poughkeepsie, NY

B MidHudson Regional Hospital of West...

Reverse

Clear All **Get Directions**

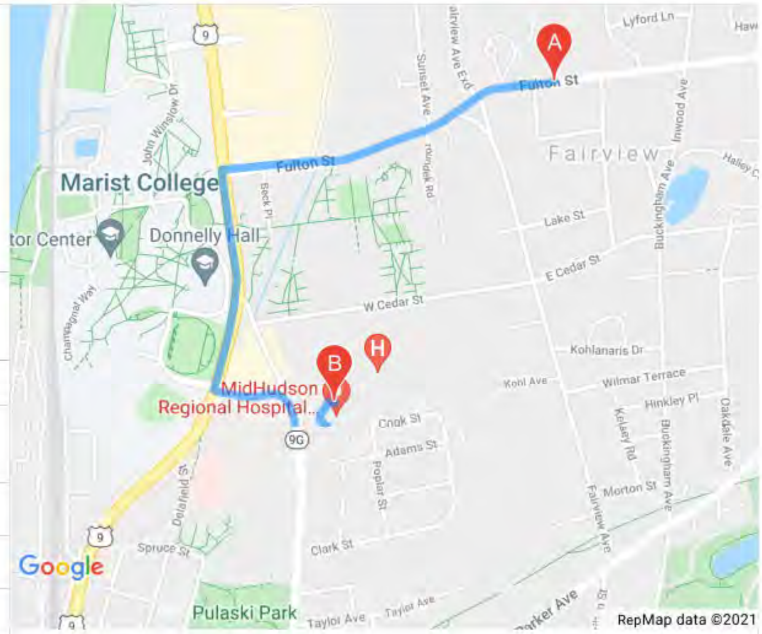
A Fulton St, Fairview, NY 12601, USA

1.8 mi. About 7 mins

1.	Head **west** on **Fulton St** toward **Center Ave**	0.6 mi
2.	Turn **left** onto **U.S. 9 S**	0.4 mi
3.	Turn **left** onto **NY-9G N**	0.4 mi
4.	Turn **left** onto **Clark St**	0.2 mi
5.	Turn **left** onto **Poplar St**	0.2 mi
6.	Turn **left**	0.1 mi
7.	Turn **right** Destination will be on the right	62 ft

B 241 North Rd, Poughkeepsie, NY 12601, USA

Map data ©2021



Sponsored Businesses

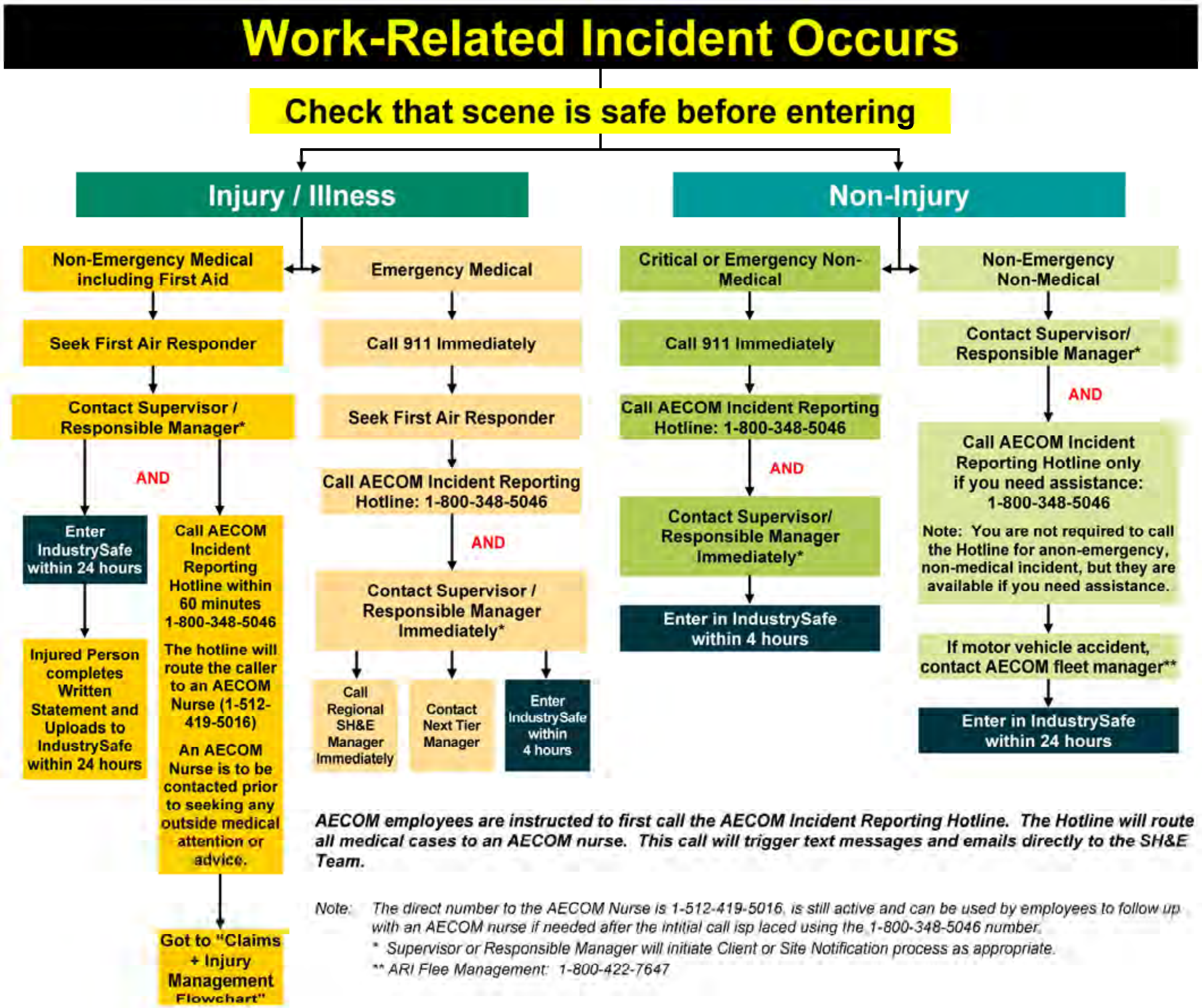
Hackensack University Medical Center
(1)
Medical Centers
More Info

(551) 996-2000
Serving the Poughkeepsie area.

Attachment B

Incident Reporting Flow Chart

Attachment B: Incident Reporting Flow Chart



AECOM

Attachment C

THA Forms, and Tailgate Safety Meeting Form

Attachment C: THA Forms, and Tailgate Safety Meeting Form

Each discrete task being performed during the project (i.e., Driving, Inspection, Sample Collection, etc.) requires a Task Hazard Assessment. If you don't have a THA for a task, obtain or develop one. The DCS Americas Templated THA Library may also be used to find previously approved THAs.

The THAs MUST be reviewed at the location the work will take place, just prior to beginning each task, and signed by all staff involved in the operation. The THAs should be consulted and updated throughout the day if conditions change using the 'On-Site Edits' lines.

Insert Task Hazard Analyses here. Include these documents after this cover sheet in the final SWP.

The preparer shall download a sufficient number of blank copies of the Task Hazard Analysis (THA) form as well as the Tailgate Meeting Form (S3AM-209-FM5) to use each day of field work, and insert after this cover sheet in the final SWP.

Task Hazard Assessment Instructions:

Each unique task or work group should have their own THAs. If workers have a THA for their task(s) in hand, they should simply review it and document the site-specific edits in the appropriate section. If workers do ***not*** have a THA for all tasks to be performed, a THA must be obtained or drafted *prior to starting work* on that task. Use additional pages as needed.

- Identify the basic steps of the task that must be performed in order and their associated hazards. Identify controls or barriers to mitigate each identified hazard.
- Clearly identify any **STOP WORK** triggers.
- Document stop work and change management if conditions/ scope changes.
- Use 4-Sight to identify and mitigate site-specific hazards throughout the day. Modify the THA as needed. Contact site supervisors or the PM for any significant scope changes or changes of expected conditions.
- All THAs shall be 3 pages (maximum) or less (preferred). If they are longer, the task is too broad.
- All hazards will use standardized nomenclature (Hazard Wheel), should be specific, detail how someone could be hurt and what the outcome could be.
- All actions to mitigate hazards must be specific, clearly aligned with its respective hazard and not generic. Avoid words such as "*proper", "correct*", or "*appropriate*"). Use specifics and numerical values (i.e., wear disposable nitrile gloves, stand back 6 feet/1.8 meters, take a 10-minute break every hour).
- PPE cannot be the only line of defense - PPE is always the last line of defense, so think through what other controls (engineering, administrative, etc.) could mitigate hazards.

Discuss as Applicable and Modify THA as Needed

Check ☑ if reviewed or mark N/A

- ☐ *Biological / Chemical / Electrical Hazards*
- ☐ *Decontamination Procedures*
- ☐ *Ergonomics – Lifting, Body Position*
- ☐ *Lock Out / Tag Out*
- ☐ *Short Service Employees – visual identifier and mentor / oversight assignment*
- ☐ *Simultaneous / Neighboring Operations*
- ☐ *Slip / Trip / Fall Hazards*
- ☐ *Specialized PPE Needs*
- ☐ *Traffic Control*
- ☐ *Waste Management / Decontamination*
- ☐ *Weather Hazards / Heat Stress / Cold Stress*
- ☐ *Work Permit Requirements:* Click here to Identify OR type N/A
- ☐ *Other:* Click here to Describe OR type N/A

Probability	Severity				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
4 – Probable	20	16	12	8	4
3 – Occasional	15	12	9	6	3
2 – Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & Safety Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & Safety Director

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Using the Matrix:

1. Identify basic steps of the task and associated hazards.
2. Calculate the initial risk rating.
3. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating.
4. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

AECOM

Americas

Daily Tailgate Meeting

S3AM-209-FM5

Instructions: Conduct meeting prior to sending crews to individual tasks. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Review scope of work and briefly discuss required and applicable topics**. This meeting is a daily refresher, not a full orientation**. Task-specific discussions associated with Task Hazard Assessment (THA) follow this meeting at the task location immediately before individual task is started.

AECOM Supervisor Name: **Phone Number:**	
AECOM SH&E Rep. Name: **Phone Number:**	
Meeting Leader:	

Date:	**Project Name/Location:**	**Project Number:**
Today's Scope of Work:		

Muster Point Location:	**First Aid Kit Location:**	**Fire Extinguisher Location:**	**Spill Kit Location:**

1. Required Topics

- ☐ Fitness for Duty requirements, all sign in / sign out
- ☐ Required training (incl. task specific) completed and current
- ☐ SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, preplanning hazard assessments / risk registers, controls, procedures, requirements, etc.)
- ☐ Task Hazard Assessments (THAs) are to be reviewed and completed for each task immediately prior to conducting
- ☐ STOP WORK Right & Responsibility- all task changes/changed conditions re-assess with THA
- ☐ Requirement to report to supervisor any injury, illness, damage, near miss, unsafe act / condition
- ☐ Emergency Response Plan – including muster point, first aid kit, fire extinguisher, clinic/hospital location
- ☐ Personal Protective Equipment (PPE) - Required items per hazard assessments in good condition / in use by all
- ☐ Equipment/machinery inspected (documented as required) and in good condition - operators properly trained/certified
- ☐ Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public
- ☐ Required checklists/records available, understood (describe):
- ☐ Lessons Learned / SH&E improvements (describe):

2. Discuss if Applicable to Today's Work

☑ ■ **Check ☑ as reviewed or mark ■ as not applicable**

- ☐ ☐ Biological/ Chemical / Electrical Hazards
- ☐ ☐ Ergonomics - Lifting, Body Position
- ☐ ☐ Lock Out/ Tag Out
- Short Service Employees - visual identifier and mentor/ oversight assignment
- ☐ ☐ Simultaneous/ Neighbouring Operations
- ☐ ☐ Slip/ Trip/ Fall Hazards
- ☐ ☐ Specialized PPE Needs
- ☐ ☐ Traffic Control
- ☐ ☐ Waste Management/ Decontamination
- ☐ ☐ Weather Hazards / Heat Stress / Cold Stress
- ☐ ☐ Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.)
- ☐ ☐ Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach):
- ☐ ☐ Other Topics (describe/attach):
- ☐ ☐ Client specific requirements (describe):

3. Daily Check Out by Site Supervisor

Describe incidents, near misses, observations or Stop Work interventions from today:	Describe Lessons Learned/ Improvement Areas from today:

The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.

Site Supervisor Name	**Signature**	**Date** **Time** (at end of day / shift)

Worker Acknowledgement / Sign In Sign Out sheets applicable to this meeting are on reverse and, if applicable, attached.

<u>All employees:</u>

- **STOP WORK if concerned / uncertain about safety / hazard or additional precaution is not recorded on the THA.**
- **Be alert and communicate any changes in personnel or conditions at the worksite to the supervisor.**
- **Reassess task, hazards, & mitigations on an ongoing basis; amend the THA if needed.**

SITE WORKERS (including AECOM Contractors and Subcontractors): Your signature below means that you understand:
* The requirement to participate in creating, reviewing, & updating hazard assessments (THA) applicable to your task(s).
* The hazards & control measures associated with each task you are about to perform.
* The permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
* That no tasks or work is to be performed without a hazard assessment.
* Your authority & obligation to "Stop Work" intervene, speak up/ listen up.

Your initials (right columns) certify that you arrived & departed fit for duty, & have reported all incidents/near misses; meaning:
* You are physically and mentally fit for duty and have inspected your required PPE to ensure satisfactory condition.
* You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
* You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or impairment/fatigue issue to the AECOM Supervisor.
* You signed out as fit / uninjured unless you have otherwise informed the AECOM Supervisor.

Print Name & Company	Signature	Initials & Sign In Time	Initials & Sign Out Time
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
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(Attach additional Site Worker sign-in/out sheets if needed) Identify number of attached sheets: ____________

SITE VISITOR / SITE REPRESENTATIVE				
Name	**Company Name**	**Arrival Time**	**Departure Time**	**Signature**

Task Hazard Assessment

Task Name:	Driving to and From Site	Control #:	01-01-12-02

Project Name:	NYSDEC Former Duso Chemical Site and Adjacent Mid-Hudson Business Park	Client:	NYSDEC	Date:	
Permits Required? (list):		Work Location:	North Road and Fulton Street Poughkeepsie, New York 12601		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☐ Safety Glasses ☐ HiVis Vest ☐ Safety Toe Boots ☐ Gloves: Leather / Nitrile ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Emergency kit Communication device (cell phone) Navigation system

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions To Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
1. Trip Planning	1a. Unauthorized driving	9	1a. You must be an AECOM authorized driver to drive for AECOM business purposes. Consult the requirements of S3AM-005-PR1. Authorized Drivers shall maintain a current driver's license with full privileges applicable to the vehicle to be operated. Develop a Journey Management Plan if applicable.	4
	1b. Inclement weather	6	1b. Evaluate weather conditions prior to beginning the travel to determine if travel should proceed. Verify your vehicle is equipped to travel in poor weather. Have supplies on hand in the event that you become stranded, including a communication device to call for help.	4
	1c. Getting Lost	6	1c. Review route in advance and program GPS prior to leaving	3
	1d. Inadequate vehicle for the site/trip	7	1d. Understand what type of vehicle is necessary to transport tools & equipment to the site. Know site conditions before departure and obtain proper vehicle, 4-Wheel drive if necessary	4
	1e. Vehicle malfunction	8	1e. Inspect vehicle prior to leaving. Verify that maintenance records are current.	4
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Driving to and From Site	Control #:	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
2. Driving	2a. Fatigue 2b. Risky driving practices	15 15	2a. Start trip well rested & take breaks when needed. Share driving responsibilities where possible. **STOP DRIVING AND PULL OVER** in a safe place if you begin nodding off or showing other signs of fatigue. 2b. Practice defensive driving techniques and avoid bad driving habits • Allow for adequate time to make the trip • Do not speed or attempt to multi-task • Do not use cell phone or text or attempt to program GPS while driving	4 4
On-Site Edits:				
3. Stops/breaks during transit	3a. Theft of equipment/materials 3b. Personal security risk	6 10	3a. Place any likely theft items out of sight and lock vehicle when leaving it. Do not leave vehicle unattended for longer than necessary. If at all possible, avoid leaving packed vehicles in public parking areas overnight, unload if possible. Park in well lighted areas. 3b. Be alert and aware of surroundings when making stops. Stop at areas which are well lit and have security if possible.	4 3
On-Site Edits:				
4.	4a.		4a.	
On-Site Edits:				

Task Hazard Analysis

Task Name:	Driving to and From Site	Control #:	Error! Reference source not found.

Additional Notes:

Task Hazard Assessment

All Employees:

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories

- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
2.	
3.	
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
1.
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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com
Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM

Task Name:	**Coronavirus Precautions – Field, Office, and Travel**	**Control #:**	**Rev #1 (08/01/2021)**

Project Name:	Various	**Client:**	Various	**Date:**	Click to enter date.
Permits Required? (list):		**Work Location:**			

THIS THA MUST BE FULLY REVIEWED AND ACKNOWLEDGED DAILY BY ALL AECOM STAFF and AECOM SUBS ON-SITE

All job steps, hazards, work practices & PPE are to be clearly understood and implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☐ Safety Glasses ☐ HiVis Vest ☐ Safety Toe Boots ☐ Hearing Protection ☒ Gloves: Click for Glove Type ☒ Other: See list below
	Additional materials and supplies required: ■ Potable water and soap (preferable) or hand sanitizer w/ 70% alcohol ■ Disinfectant wipes ■ Tissues ■ Disposable gloves ■ Face coverings/face masks ■ One Gallon Zip Lock Bags ■ Safety goggles ■ Disinfectant spray [List of Cleaning Products to Kill Coronavirus]
Tools & Equipment:	■

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions to Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Fitness for Duty check (performed at home prior to work)	1a. Being unfit for duty – impacted by illness including coronavirus	4	1a. Ensure you are fit for duty Are you or have you been in any of these situations? – I am unvaccinated and have had close contact with a confirmed case or a symptomatic person under investigation for coronavirus in the last 14 days. – A doctor requested me to be tested for coronavirus or instructed me to self-quarantine? – A member of my household or someone I was in close contact within the last 14 days experienced some of the following symptoms: fever, cough, shortness of breath, fatigue, sore throat, chills, gastro-intestinal disease or diarrhea, loss of taste/smell. – I have or previously had some of the following symptoms in the last 7 days: fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body ache, headache, new loss of taste/smell, sore throat, congestion or runny nose, nausea or vomiting, or diarrhea.. – Where required, my temperature check today shows a fever, without the use of fever reducing medications in the last 24 hours? (100.4 F [37.8C] or above or exceeding criteria required by local order or client requirements). **If response is a YES, then do not access the workplace**. If AECOM employee, contact your Supervisor and the AECOM Nurse at **512-419-5016** for advice. **If response is a NO or Yes, but released by AECOM nurse, you can proceed to work**. You may be asked to check your temperature again when you arrive to your workplace.	2
On-Site Edits:				
2. Planning the trip	2a. Potential exposure to Coronavirus	4	2a. Map route in advance to minimize the potential for exposure and utilize the least populated route of travel where feasible. Avoid entering public places whenever possible. Review vaccination, mask mandate requirements, etc, at destination and for any likely stops along the way and plan to adhere to these requirements. If traveling to an AECOM office, complete Voluntary Vaccine Declaration Form (if you are vaccinated) to be permitted in offices without face coverings where legally permitted .	2
On-Site Edits:				

Task Hazard Assessment

AECOM

Task Name:	Coronavirus Precautions – Field, Office, and Travel	Control #:	Rev #1 (08/01/2021)

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions to Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
3. Hazards from travel (via vehicle, air travel, public transit, etc)	3a. Possible exposure from vehicle passengers. 3b. Possible exposure from airline/transit agency travel	8 8	3a. Carpooling is permitted if users voluntarily share that they are both vaccinated; if not, limit to one person per vehicle whenever possible. If an unvaccinated passenger must ride with you, limit to one passenger and have them sit in the rear passenger side seat. Unvaccinated individuals must wear face coverings. Crack and/or open windows and use fan to recirculate air. 3b. Review airline or transit agency guidelines for additional safety precautions that may be applicable. When possible, consider traveling during non-peak hours when there are likely to be fewer people. Follow social distancing guidelines by staying at least 6 feet (2 meters) from people who are not from your household. In enclosed spaces with other passengers, unvaccinated individuals must wear a face covering and others should consider wearing one as well.	4
On-Site Edits:				
4. Stopping for restroom breaks and food, fueling, supplies, etc	4a. Possible exposure due to contact with members of the general public at gas stations, convenience stores, restrooms, etc.	12	4a. Plan trip to reduce the need to stop for food or restroom breaks. Bring your own food/water/snacks if possible. If you must stop, try avoid entering public places (use drive through services if possible). If you must enter public places, practice social distancing and wear a face covering if unvaccinated. Wash hands with soap and water for at least 20 seconds or use a hand sanitizer before and after entering public places and restrooms. Have soap and water, antibacterial hand wipes or spray, 70% + alcohol hand sanitizer available.	4
On-Site Edits:				
5. Field Work	5a. Working Around Others	12	5a. **Unvaccinated personnel must maintain at least 6-foot distance from others to the extent possible and wear face coverings.** All employees should practice social distancing at tailgate meetings, in break rooms and job trailers. Limit the number of people in job trailers and other confined areas at any one time so that this distance can be maintained. If possible, hold meetings outside. If indoors, open window(s) for circulation. Clean all surfaces of your hands often with soap and water for at least 20 seconds. Where available, also use a hand sanitizer that contains at least 60% alcohol. When using hand sanitizer, be sure your hands are completely dry prior to touching any objects or surfaces. Wear safety glasses or goggles and avoid contact/touching of face, eyes, nose, and mouth. Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw used tissues in the trash. Immediately wash or sanitize your hands. If the need arises to enter a personal residence, **prepare a separate task specific THA** for this task	4
On-Site Edits:				
6. Office Work	6a. Working Around Others	12	6a. AECOM recommends all employees obtain a Coronavirus vaccine. To work in AECOM offices after being fully vaccinated without the requirement to wear a mask or socially distance, please complete the AECOM voluntary vaccination self-attestation form on Workday. For a step-by-step guide to using the Voluntary Vaccination Declaration tool in Workday, click here.. **Unvaccinated personnel must maintain at least 6-foot distance from others to the extent possible and wear face coverings when not at your personal, socially-distanced work station.** Adhere to office-specific Workplace Readiness Plans where available (or the AECOM US Offices Workplace Readiness Plan where site-specific plans are no longer required). This plan may be reviewed at the following link: US DCS Office Workplace Readiness Plan	4
On-Site Edits:				

Task Hazard Assessment

Task Name:	Coronavirus Precautions – Field, Office, and Travel	Control #:	Rev #1 (08/01/2021)

Additional Notes:

Where required, supplies (i.e., disinfectant spray/wipes, soap/hand sanitizer, nitrile gloves) should be made available prior to starting work. Request re-supply if stock runs low.

- Use disinfectant products that contain at least 70% alcohol. Use alcohol-based hand sanitizer that contains at least 60% alcohol. Wash hands with soap and water whenever available.
- If any staff are showing any possible symptoms of or have been in recent direct contact with others showing symptoms of CORONAVIRUS, STOP WORK. Notify the site supervisor and the project manager and go home and/or stay home. Notify your AECOM Regional or Area SH&E Manager.
- A list of approved disinfectants for use against SARS-CoV-2, the cause of CORONAVIRUS, is available here: US EPA List of Disinfectants Effective Against Coronaviruses

Revision Log

Version	Issued / Revised By	Date	Revision Summary
THA Revisions			
1	Patrick Walz	August 1, 2021	Consolidated and replaced previous, separate THAs for Field/Field Office work, travel, etc. Takes into account changes to CDC, AECOM, etc requirements related to Covid as the pandemic has progressed and vaccines have been rolled-out.
Project-Specific Revisions			

Task Hazard Assessment

AECOM

Task Name:	**Coronavirus Precautions – Field, Office, and Travel**	**Control #:**	**Rev #1 (08/01/2021)**

All Employees:

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last-minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories

- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com
Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

Task Name:	**Geoprobe Drilling Oversight**	**Control #:**	**01-01-03-01**

Project Name:	**NYSDEC Former Duso Chemical Site and Adjacent Mid-Hudson Business Park**	**Client:**	NYSDEC	**Date:**	
Permits Required? (list):		**Work Location:**	North Road and Fulton Street Poughkeepsie, New York 12601		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile ☒ Hearing Protection ☐ Other:
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Mobilization	1a. Striking unidentified underground utilities	15	1a. Call public utility locating service prior to initiating work activities. Use private locating service to mark out areas on private property. Verify location of utility marks; do not perform intrusive work if utility location marks cannot be found or if marks are destroyed. Preserve utility marks as much as possible. Call to have utilities remarked if unsure as to their location.	4
	1b. Striking overhead utilities	15	1b. Follow the requirements of S3AM-322-PR1 Overhead Lines. Verify adequate clearance of all drilling locations prior to setting up at drilling location.	4
On-Site Edits:				
2. Setting up at drilling location	2a. Biological hazards causing bites, stings or other injury	8	2a. Examine ground surface for biological hazards prior to setting up equipment. If biological hazards exist, move equipment to a different area for set up if possible. Machetes, or other fixed open blade tools, are not permitted for clearing vegetation. Use insect repellent and check clothing for ticks periodically when applicable.	4
	2b. Struck by traffic	10	2b. Be alert to other vehicles or pedestrians if work area is in an area with public access. Communicate with any heavy equipment operators in the area to ensure they know where you and the equipment are located. Don high visibility vest.	4
	2c. Unstable Rig platform	10	2c. Verify with contractor that rig is set up level and properly chocked and blocked.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				
3. Oversight of rig inspection	3a. Mechanical failure of equipment 3b. Emergency shut off disabled	**10** 6	3a. Verify that drilling contractor inspects equipment daily using S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection or equivalent. 3b. Verify that kill switch on rig is tested and operational	4 3
On-Site Edits:				
4. Drilling Oversight	4a. Flying debris, caught by/ struck by injuries 4b. Caught in/by equipment 4c. Exposure to contaminants 4d. Noise-induced hearing loss	8 **10** 8 5	4a. Keep a safe distance away during rig operation. Do not talk on cell phone or be distracted by paperwork when in immediate proximity to rig. Wear PPE including hard hats, steel-toe safety boots, safety glasses, and hearing protection. 4b. Keep hands, feet and other body parts shall be kept away from moving parts. Do not approach operator without making eye contact and getting approval. 4c. Position yourself upwind of the borehole whenever possible. Perform air monitoring using a PID as described in the HASP. **STOP WORK** if the action level is exceeded. 4d. Setup away from noisy operations. Don't be near the rig when hammering. Wear hearing protection.	4 4 4 3
On-Site Edits:				
5.	5a.		5a.	
On-Site Edits:				
6.	6a.		6a.	

Task Hazard Analysis

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
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On-Site Edits:					
7.		7a.		7a.	
On-Site Edits:					

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	**Control #:**	Error! Reference source not found.

All Employees:

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- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories

- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

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Printed Name	**Signature**
1. Supervisor:	
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Task Hazard Analysis

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Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

Task Name:	Groundwater Sampling – Low Flow	Control #:	01-01-05-12

Project Name:	**NYSDEC Former Duso Chemical Site and Adjacent Mid-Hudson Business Park**	**Client:**	NYSDEC	**Date:**	
Permits Required? (list):		**Work Location:**	North Road and Fulton Street Poughkeepsie, New York 12601		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile, cut resistant ☐ Hearing Protection ☐ Other:		
Tools & Equipment:	Hand tools	YSI	Pump

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Visually clear proposed sampling locations	1a. Exposure to biological hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reactions, rabies.	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant, use a broom or a rake to move vegetation, not your hand or foot, move slowly	4
	1b. Slip/trips, falls due to uneven terrain resulting in broken bones or torn ligaments.	6	1b. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well sampling in the area safe.	4
	1c. Struck by vehicle resulting in severe trauma or death	**10**	1c. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest.	4
On-Site Edits:				
2. Open well casing/flush-mount covers and well plug lock.	2a. Cuts/lacerations/crushing, bruises	6	2a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling. Don knee pads.	2
	2b. Back strain from improper lifting	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2
				2

Task Hazard Analysis

Task Name:	Error! Reference source not found.	**Control #:**	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	2c. Vapor exposure resulting in inhalation hazards or illness 2d. Biologic hazards; insects, poisonous plants, and animals	4 6	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire. 2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	4
On-Site Edits:				
3. Installing tubing in well and setting up equipment.	3a. Cuts/lacerations/crushing, bruises	6	3a. Avoid touching sharp material/edges. Keep face, hands, fingers feet clear when cutting tubing and setting up equipment. Wear cut resistant ANSI 2 gloves with disposable nitrile over gloves	2
On-Site Edits:				
4. Removing tubing from well	4a. Exposure to chemical hazards in groundwater resulting in inhalation hazard or illness 4b. Cuts/lacerations/bruises to knee (flush mount)	4 4	4a. Stay upwind to avoid vapor exposure 4b. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch	2 2
On-Site Edits:				
5. Closing well casings/flush mount covers	5a. Cuts/ lacerations/crushing, bruises 5b. Back strain from heavy/awkward material handling	4 4	5a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers feet clear when closing well cover. Don knee pads and inspect ground before kneeling down. 5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2

Task Hazard Analysis

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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
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On-Site Edits:				
6. Gather sampling equipment and tools, place in work vehicle	6a. Cuts/lacerations/crushing/bruises from gathering or dropping equipment 6b. Aches and strains from improper lifting	3 4	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing. 6b. Bend and lift with legs. Keep back straight. Take regular rest/stretch breaks. Change position regularly. Team lift is required for items over 50 lbs (or awkward items)	2 2
On-Site Edits:				
7.	7a.		7a.	
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

Task Name:	Error! Reference source not found.	**Control #:**	Error! Reference source not found.

All Employees:

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- ***What am I about to do?***
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Task Hazard Analysis

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Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	**Traffic Control For Working Adjacent to a Roadway (Clear Zone)**	**Control #:**	**01-01-20-03**

Project Name:	**NYSDEC Former Duso Chemical Site and Adjacent Mid-Hudson Business Park**	**Client:**	NYSDEC	**Date:**	
Permits Required? (list):		**Work Location:**	North Road and Fulton Street Poughkeepsie, New York 12601		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☐ Safety Glasses ☒ HiVis Vest, Class ___ ☒ Safety Toe Boots ☐ Ear Plugs/Muffs NRR____ ☐ Gloves: Leather/HiVis ☐ Other: ☐ Side Impact Helmet ☐ HiVis Vest Clothing, Class E ☐ Personal light ☐ Hearing Protection ☐ Other: ____________
Tools & Equipment:	☐ Temporary Traffic Control Devices per Traffic Control Plan ☐ Personal ☒ Warning signs ☒ Cones ____" ☐ 4-Way Beacon (Vehicle) ☐ Insect repellent ☒ Sunscreen ☒ Rain Gear (Class E) ☐ Shade ☐ Safety Whistle ☐ Portable lighting for work area, light meter

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Pull off roadway to shoulder or beyond shoulder	1a. Critical injuries caused by vehicle collision upon slowing onto secure location.	15	1a. Activate vehicle warning lights and begin slowing vehicle early.	4
	1b. Critical injuries caused by being struck from behind when parked on the shoulder or further.	15	1b. Do not pull over where rear view visibility is poor (curves, overhead obstructions, trees etc.). Select area with enough room to exit the vehicle and have an emergency escape route for errant vehicles. Set parking brake and keep seatbelt on at all times, even when parked.	4
	1c. Vehicle damage from getting stuck in mud or being on steep slopes	15	1c. Observe ground cover and obstructions on shoulder and avoid steep or muddy conditions. Set your parking brake and turn your wheels away from the direction of the slope.	4
On-Site Edits:				
2. Exiting the vehicle upon parking	2a. Sustaining critical injuries caused by being struck by moving traffic while exiting the vehicle.	15 8	2a. Observe traffic flow prior to exiting the vehicle. Exit vehicle when there is a break in traffic. Walk toward rear of vehicle, watch oncoming traffic. Walk immediately to protected side of vehicle and access tools and equipment from protected side. Never stand directly in front of vehicle, leave minimum 50ft of buffer between you and the front of the vehicle.	8 3

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Traffic Control For Working Adjacent to a Roadway (Clear Zone)**	**Control #:**	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	2b. Straining back or other lower body injury caused by unsafe terrain, loose footing, slips or falls. 2c. Injury or illness caused by unwanted contact with animals, insects or biological hazards.	4	2b. Assess the terrain, slopes greater the 30 degrees require fall protection. Assess work area for unprotected ledges or parapet style walls that are less than 42" require additional fall protection if fall distance is greater than 4' or 6' depending on location. 2c. Avoid heavy brush/grass. Wear insect repellent and poisonous plant barrier creams, as well as disposable coveralls, gloves and boot covers.	2
On-Site Edits:				
3. Unload traffic control equipment from rear of work truck	3a. Critical injuries caused by being struck by moving traffic	**15**	3a. Continue warning lights/beacons. Face traffic, monitor general traffic patterns. Walk in protected areas where possible (behind guard rails). Leave an emergency egress route in case of an errant vehicle.	8
	3b. Bruising or broken finger due to getting caught in a pinch point in the vehicle or tailgate.	8	3b. Avoid placing hands near the sides or bottom of the tailgate and other collapsible parts of traffic control devices, tools, etc. Wear leather or Kevlar gloves.	4
	3c. Bruise, strain, or fracture to body from slip, trip or fall from carrying too much equipment at one time or uneven surfaces	8	3c. Never carry more than 4 cones, fewer if 4 could impede visibility or limits movement. Never lift more than you are capable of lifting safely, and use good body mechanics. Inspect your walking path to assure it is clear, notice any changes in walking surfaces and make adjustments to your gait to accommodate for changes.	4
On-Site Edits:				
4. Deploying temporary traffic control devices (cones and light weight signage)	4a. Critical injuries caused by being struck by moving traffic while deploying traffic control devices.	**15**	4a. Face and monitor moving traffic. Leave an emergency egress route in case of an errant vehicle. If you cannot maintain view of on-coming traffic stop work and obtain help from a spotter. Place traffic control in a sequence that offers greatest protection from moving traffic, typical the devices further from the work zone are placed first. Set-up may be adjusted to increase protection but TCP elements should never be removed of modified in a way that decreases protection.	8 2

Task Hazard Analysis

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	4b. Straining back or other parts of body due to improperly lifting or moving heavy objects.	4	4a. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate, not over the side of the truck bed.	
On-Site Edits:				
5. Verifying traffic control set up	5a. Critical injuries caused by being struck by errant vehicle in the work zone.	15	5a. Maintain constant vigilance. Verify that all access roads drive ways, parking areas, emergency use areas with in the work zone are protected with TTCD.	8
	5b. Misdirection and confusion resulting in unsafe traffic conditions due to incorrect or insufficient set up of traffic control.	4	5b. Assure that the TTCD are spaced appropriate for the speeds of the motoring public, shorten distance between cones if speeds are slower than anticipated. Increase number of (and distance of) advance warning signs if drivers fail to yield or slow to traffic control set up.	2
	5c. Misdirection or confusion in work flow by unintended interaction with public in the work zone.	4	5c. Make verbal contact with other workers or the public in the areas to alert them to your presence and orientate them to the work zone. Do not rely on eye contact as a means of communication.	2
On-Site Edits:				
6.	6a.		6a.	
On-Site Edits:				

Task Hazard Analysis

Task Name:	Traffic Control For Working Adjacent to a Roadway (Clear Zone)	Control #:	Error! Reference source not found.

Additional Notes:

Task Hazard Analysis

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Attachment D

Applicable AECOM SHE Procedures

Attachment D: Applicable AECOM SHE Procedures

Review the list below, check the boxes for hazards or activities planned as part of this project, and attach the applicable procedures, as needed for use in the field. All AECOM SH&E Procedures, in their controlled copy version, are available on the internal SH&E Policy and Procedures Ecosystem page.

Programmatic procedures referenced in this document (for example SH&E Training) DO NOT need to be printed for inclusion in this HASP. Only procedures that are needed for field activity reference and application MUST be printed in full and included in this section.

	Hazard/ Activity (Note: Text in this column links to procedure)	Applicable Procedure		Hazard / Activity (Note: Text in this column links to procedure)	Applicable Procedure
☐	Abrasive Blasting	S3AM-335-PR1	☐	Highway and Road Work	S3AM-306-PR1
☐	Aerial Work Platforms	S3AM-323-PR1	☐	Hoists Elevators and Conveyors	S3AM-343-PR1
☐	All-Terrain Vehicles	S3AM-319-PR1	☐	Hot Work	S3AM-332-PR1
☐	Blasting and Explosives	S3AM-336-PR1	☐	Ladders	S3AM-312-PR1
☐	Bloodborne Pathogens	S3AM-111-PR1	☐	Lockout Tagout	S3AM-325-PR1
☐	Cofferdams	S3AM-344-PR1	☐	Machine Guarding Safe Work Practice	S3AM-326-PR1
☒	Cold Stress	S3AM-112-PR1	☐	Marine Safety and Vessel Operations	S3AM-333-PR1
☐	Compressed Air Systems & Testing	S3AM-337-PR1	☐	Material Storage	S3AM-316-PR1
☐	Compressed Gases	S3AM-114-PR1	☐	Mine Site Activities	S3AM-341-PR1
☐	Concrete Work	S3AM-338-PR1	☐	Mining Operations	S3AM-345-PR1
☐	Confined Spaces	S3AM-301-PR1	☐	Non Ionizing Radiation	S3AM-121-PR1
☐	Corrosive Reactive Materials	S3AM-125-PR1	☐	Overhead Lines	S3AM-322-PR1
☐	Cranes and Lifting Devices	S3AM-310-PR1	☐	Powder-Actuated Tools	S3AM-327-PR1
☐	Demolition	S3AM-339-PR1	☐	Powered Industrial Trucks	S3AM-324-PR1
☐	Diving (scientific and commercial)	S3AM-334-PR1	☐	Radiation	S3AM-120-PR1
☒	Drilling, Boring & Direct Push Probing	S3AM-321-PR1	☐	Railroad Safety	S3AM-329-PR1
☐	Electrical Safety	S3AM-302-PR1	☐	Respiratory Protection	S3AM-123-PR1
☐	Excavation	S3AM-303-PR1	☐	Scaffolding	S3AM-311-PR1
☐	Fall Protection	S3AM-304-PR1	☐	Steel Erection	S3AM-340-PR1
☐	Flammable and Combustible Liquids	S3AM-126-PR1	☐	Temp. Floors, Stairs, Railings, Toe-boards	S3AM-342-PR1
☐	Gauge Source Radiation	S3AM-122-PR1	☒	Underground Utilities	S3AM-331-PR1
☐	Hand and Power Tools	S3AM-305-PR1	☐	Underground Work	S3AM-330-PR1
☐	Hazardous Waste Operations	S3AM-117-PR1	☒	Wildlife, Plants and Insects	S3AM-313-PR1
☒	Heat Stress	S3AM-113-PR1	☐	Working Alone	S3AM-314-PR1
☒	Heavy Equipment	S3AM-309-PR1	☐	Working On and Near Water	S3AM-315-PR1
☐	High Altitude	S3AM-124-PR1			

Americas

Cold Stress

S3AM-112-PR1

1.0 Purpose and Scope

1.1 To protect employees from the severest effects of cold stress (hypothermia) and cold injury and to identify exposures to cold working conditions under which it is believed nearly all employees can be repeatedly exposed without adverse health effects.

1.2 This procedure applies to all AECOM Americas based employees and operations, and any other entity and its personnel contractually required to comply with this document's content, working outdoors in damp and cool (below 50 degrees Fahrenheit [°F] or 10 degrees Celsius [°C]) conditions or anytime temperatures are below 32°F or 0°C.

2.0 Terms and Definitions

2.1 **Cold Stress** – The production of physiological effects due to cold temperatures and\or wind chill.

2.2 **Equivalent Chill Temperature (ECT)** – Also known as Wind Chill (see below).

2.3 **Frostnip** – Superficial cooling of tissues without cellular destruction.

2.4 **Frostbite –** Freezing of tissue, resulting in tissue destruction.

2.5 **Hypothermia –** Condition of reduced core body temperature to 95ºF (35ºC) resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.

2.6 **Wind Chill –** The combined effect of air temperature and wind. Also expressed as "equivalent chill temperature" (ECT), wind chill is defined as heat loss resulting from the effects of air temperature and wind velocity upon exposed skin.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-128-PR1 Medical Screening & Surveillance Program

3.3 S3AM-208-PR1 Personal Protective Equipment

3.4 S3AM-314-PR1 Working Alone

3.5 S3AM-315-PR1 Working On or Near Water

3.6 S3AM-333-PR1 Marine Safety & Vessel Operations

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

- Ensuring the safety of employees on their project sites, consistent with regulatory standards.
- Implement cold stress prevention measures as applicable at each work site.
- Develop/coordinate a work-warning regimen, as applicable.
- Confirm cold stress hazard assessments/evaluations were completed for the planned activities.
- Assign employees physically capable of performing the assigned tasks. Consider acclimation to cold weather when evaluating employee capability.

- Confirm employees are properly trained to recognize the symptoms of cold stress.

4.1.2 **Safety, Health and Environment (SH&E) Manager**

- Conduct/support cold stress assessments/evaluations.
- Conduct/support incident investigations related to potential cold stress-related illnesses.
- Assist project teams develop appropriate work-warming regimens.
- Provide cold stress awareness training.

4.1.3 **Supervisor**

- Identify the tasks that may be most impacted by cold stress and communicate the hazard to the assigned employees.
- Confirm that employees have been trained on the recognition of cold stress-related illnesses.
- Confirm that adequate supplies of warm fluids/drinks are readily available to employees.
- Confirm that a warm/sheltered rest area is available, as applicable.
- Conduct cold stress monitoring, as applicable.
- Implement the work-warming regimen.
- Confirm that first aid measures are implemented once cold stress symptoms are identified.
- Confirm that employees are physically capable of performing the assigned tasks and are not in a physically compromised condition.

4.1.4 **Employee**

- Observe each other for the early symptoms of cold stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Report to work in a properly rested condition.
- Report all suspected cold stress-related illnesses.

4.2 Requirements

4.2.1 Carefully plan work anticipated to be performed in cool or cold conditions. If possible, heavy work should be scheduled during the warmer parts of the day or when the wind is most calm. Include costs in project budgets for specialized equipment and supplies needed to complete the field activities.

4.2.2 Staff working in extreme cold (wind chill or ECT below 10°F or -12°C) shall not work alone. The Buddy System shall be utilized to keep an eye on each other and to watch for signs of cold stress. Refer to *S3AM-314-PR1 Working Alone*. Watch for symptoms and signs of hypothermia

4.2.3 Monitor weather forecasts and weather conditions such as ambient temperature, wind speed, and precipitation. Use observations prior to entering and while in the field to ensure appropriate protections are in place:

- If possible, move the work to a warm location.
- If possible and as applicable, erect shelters or screens around the work area.
- If possible, heat the work area.
- If possible, adjust schedule according to the cold conditions, work level and worker acclimatization.
- Implement a work-warming regimen by taking breaks out of the cold. As applicable, consult *S3AM-112 ATT1 Temperature Thresholds* to determine wind chill and work-warming schedule.
- Take frequent short breaks in warm dry shelters to allow your body to warm up. Limit time of exposure to the cold. If shelter is not readily available, consider supplying temporary shelters.

- Provide assistance to prevent body heat loss, such as:
  - Providing appropriate sources of heat (e.g. warm packs, portable heaters, etc.).
  - Use of insulating materials on equipment handles when temperatures drop below 30°F (-1°C).

4.2.4 All staff working in extreme cold or snow conditions should understand the following guidelines for preventing and detecting hypothermia and frostbite; refer to *S3AM-112-ATT2 Symptoms & Treatment*:

- Ensure appropriate PPE requirements are established and adhered to.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Because prolonged exposure to cold air or to immersion in cold water at temperatures even well above freezing can lead to dangerous hypothermia, whole-body protection shall be used.
- Eat high calorie snacks to help maintain body metabolism.
- Confirm extra blankets or sleeping bags are on-site.
- Drink plenty of warm liquids. It is easy to become dehydrated in cold weather.
- Avoid caffeine and alcohol, which can act as diuretics. Alcohol consumption, depending upon quantity, can dilate blood vessels enhancing body heat loss or constrict blood vessels decreasing heat delivery to extremities.
- NEVER IGNORE SHIVERING. Persistent or violent shivering is a clear warning that you are on the verge of hypothermia.
- If you experience frost bite or hypothermia, find shelter and warmth and contact a medical practitioner if symptoms persist, refer to *S3AM-128-PR1 Medical Screening & Surveillance*.

4.3 Training

Before they begin work in a cold environment, employees that might be exposed to cold stress will be informed of the potential for cold stress and how to prevent cold stress. Employees that have not had the training within the twelve prior months shall repeat the training before exposure to cold stress, refer to *S3AM-003-PR1 SH&E Training*. Employees potentially exposed to cold stress will receive training including, but not limited to:

4.3.1 Sources of cold stress, the influence of protective clothing, and the importance of acclimatization.

4.3.2 How the body loses heat.

4.3.3 Recognition of cold-related illness symptoms.

4.3.4 Cold stress preventative/corrective measures including, but not limited to:

- Weather monitoring.
- Proper eating and drinking practices.
- Work-warming schedules and proper re-warming techniques.
- Buddy system.
- Safe cold work practices appropriate to the work that is to be performed.
- Proper use of cold environment personal protective clothing.

4.3.5 The harmful effects of excessive alcohol consumption in a cold stress environment.

4.3.6 The hazards associated with unstable snow or ice build ups.

4.3.7 First aid procedures for symptoms related to cold stress.

4.4 Personal Protective Equipment (PPE)

Wearing the right clothing is crucial to avoiding cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, on the other hand, retains its insulation even when wet. Adequate insulating dry clothing will be required in air or wind chill temperatures below 40 °F (4.4°C)

All PPE will comply with the requirements of *S3AM-208-PR1 Personal Protective Equipment* and consider the following requirements:

4.4.1 Wear at least 3 layers of clothing to help prevent cold stress. It is important to preserve the air space between the body and the outer layer of clothing to retain body heat.

- Wear a middle layer of down, wool, or similar materials to provide insulation.
- Avoid cotton, especially blue jeans.
- Wear an outer layer to break the wind and allow some ventilation (e.g., Gortex® or nylon)
- Do not wear tight clothing. Loose clothing allows better ventilation.

4.4.2 Wear proper clothing, including head coverings and gloves or mittens for cold, wet, and windy conditions.

4.4.3 Wear a hat or hardhat liner. Up to 40 percent of body heat can be lost when the head is left exposed.

4.4.4 Use insulated footwear with adequate traction to prevent slips and falls.

4.4.5 Wear insulated boots or other insulated footwear, and insulated gloves to help reduce the chance of frostbite.

4.4.6 Keep a change of dry clothing available in case work clothes become wet.

4.4.7 Eye and face protection for employees employed outdoors in a snow and/or ice-covered terrain should be supplied.

- Sunglasses (with UVA and UVB protection) and sunscreen should be used when there is a persistent combination of snow and direct sun.
- Special safety goggles to protect against blowing ice crystals and ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.
- Ensure face guards are used to protect skin in cold, windy conditions, including riding on an unshielded vehicle.

4.5 General Cold Stress Prevention Measures

4.5.1 In order to prevent hypothermia:

- Wear appropriate clothing and PPE as determined by the weather conditions.
- When active, ventilate excess heat by opening or removing outer layers of clothing to avoid sweating.
    - Start with the mitten or gloves, unless protection from ice, snow, or cold metal surfaces is needed.
    - Next remove head gear and neck wrappings.
    - Then coats/parkas should be opened at the waist and sleeves.
    - Finally, layers of clothing should be taken off.
    - When resting or tired, or colder conditions are encountered, add additional layers of clothing/ close outer layers in the reverse of the above order, or get out of the cold. Have a sweet drink but do not indulge in heavy eating.

- Garments worn to keep out rain and spray should also allow water vapor to escape.
- Take advantage of heat from the sun and stay out of the wind as much as possible.
- Have available emergency shelter providing protection from wind and rain and insulation from the ground.
- Replace wet clothing. If wet clothing cannot be replaced, then cover it with a layer of non-breathing material to prevent evaporation. Place an insulation layer over this non-breathing material.
- Get adequate rest; conserve energy.
- Get adequate nutrition to replenish energy stores; rest after meals.
- Drink adequate fluids to avoid dehydration.
- If any project / location staff member shows signs of hypothermia, stop and treat him/her.

4.5.2 In order to prevent frost bite:

- Dress to prevent hypothermia and protect the feet and hands.
- Avoid obstruction of circulation by, for example, tight boots or tightly fitting clothing.
- Avoid nicotine (particularly cigarettes) and do not consume alcohol.
- Keep ears and nose covered and out of the wind.
- Frostbite of the corneas of the eyes can be prevented by protective goggles.
- Adopt a "buddy system" of constantly watching the faces of others in the party for white skin tissue, which is evidence of frostbite (frostnip).
- Practice constant personal vigilance for signs of trouble in one's own fingers and toes; when in doubt, investigate thoroughly before it is too late.

4.5.3 Adequate, insulating dry clothing that will help maintain core temperatures above 96.8°F (37°C) shall be provided to employees if work is performed in air temperatures below 40°F (4.4°C). Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.

4.5.4 An Equivalent Chill Temperature (ECT) chart relating the actual dry bulb air temperature and the wind velocity is presented in *S3AM-112-ATT1 Temperature Thresholds*. Unless unusual or extenuating circumstances exist, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Superficial or deep local tissue freezing will occur only at temperatures below 32°F (0°C) regardless of wind speed. However, older employees, those with circulatory problems and those with previous cold injuries require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions that should be considered.

4.5.5 Continuous exposure of skin should not be permitted when the air speed and temperature results in an ECT of –25°F (-32°C) or below.

4.5.6 At air temperatures of 40°F (4.4°C) or less, it is imperative that employees who become immersed in water or whose clothing becomes wet be immediately removed from the cold environment, provided a change of clothing, and be treated for hypothermia.

4.5.7 If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.

4.5.8 Adequate protection, such as general ventilation, shall be incorporated into any warming shelter design to prevent carbon monoxide poisoning.

4.5.9 Operation of internal combustion or similar devices within warming shelters is prohibited.

4.5.10 If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.

4.5.11 Walking and working surfaces shall be cleared of ice and snow to prevent slips and falls.

4.5.12 Confirm that employees carry fire starter materials if working in remote areas.

4.5.13 Supplies such as PPE, fuels, enclosures, de-icing, traction aids, warm drinks, and batteries will be specified by the SH&E Manager and/or the Manager and made available. These supplies will be inspected at least weekly during cold weather projects and replaced when necessary.

4.6 Cold Stress Prevention Measures for the Hands

4.6.1 Special protection of the hands is required to maintain manual dexterity for the prevention of accidents including, but not limited to the following:

- If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 60ºF (15ºC), special provisions should be established for keeping the employees' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below 30ºF (-1º C).
- If the air temperature falls below 60ºF (15ºC) for sedentary work, 40ºF (4.4º C) for light work, or 20ºF (-6ºC) for moderate work, and fine manual dexterity is not required, employees should use gloves.

4.6.2 To prevent contact frostbite, employees should wear anti-contact gloves:

- When cold surfaces below 20°F (-6°C) are within reach, each employee should be warned to prevent inadvertent contact by bare skin.
- If the air temperature is 0°F (-18°C) or less, employees should protect their hands with mittens or appropriate gloves. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens or gloves.
- Ensure an adequate supply of dry gloves is available to replace wet gloves.

4.6.3 Provisions for additional total body protection are required if work is performed in an environment at or below 40ºF (4.4ºC). The employees should wear cold protective clothing appropriate for the level of cold and physical activity.

4.6.4 Additional Cold Stress Prevention Measures:

For work practices at or below 10ºF (-12ºC) ECT, the following will apply:

- The employee should be under constant protective observation (buddy system or supervision).
- The work rate should not be so high as to cause heavy sweating that will result in wet clothing. If heavy work is being performed, rest periods should be taken in heated shelters and opportunities to change into dry clothing should be provided.
- New employees should not be required to work full time in the cold during the first days of employment until they become acclimated to the working conditions and required protective clothing. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.
- The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the employee.
- The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The employee should be protected from drafts to the greatest extent possible.

4.6.5 Employees handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperatures below 40ºF should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of "cryogenic fluids" or those liquids with a boiling point that is just above ambient temperature.

4.6.6 Trauma sustained in freezing or subzero conditions requires special attention, because an injured employee is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

4.7 Hypothermia in Water

4.7.1 Loss of body heat heat to the water is a major cause of deaths in boating and working near water incidents. Often the cause of death is listed as drowning; however, the primary cause is often hypothermia. It should also be noted that alcohol lowers the body temperature around 2 to 3 degrees by dilating the blood vessels. Do not drink alcohol around cold water. The following table shows the effects of hypothermia in water:

WATER TEMPERATURE		EXHAUSTION	SURVIVAL TIME
32.5°F	(0°C)	Under 15 minutes	Under 15 to 45 minutes
32.5 to 40°F	(0 to 4°C)	15 to 30 minutes	30 to 90 minutes
40 to 50°F	(4 to 10°C)	30 to 60 minutes	1 to 3 hours
50 to 60°F	(10 to 16°C)	1 to 2 hours	1 to 6 hours
60 to 70°F	(16 to 21°C)	2 to 7 hours	2 to 40 hours
70 to 80°F	(21 to 27°C)	3 to 12 hours	3 hours to indefinite
Over 80°F	(27°C)	Indefinite	Indefinite

4.7.2 Some points to remember when water is a potential hazard:

- Wear a personal flotation device when drowning is a potential hazard. Refer to *S3AM-315-PR1 Working On or Near Water*, and *S3AM-333-PR1 Marine Safety & Vessel Operations*.
- If the water is less than 50°F (10°C), wear a wet suit or dry suit for work in water (e.g., wading, or if a significant potential to fall in water exists).
- While in the water, do not attempt to swim unless to reach nearby safety. Unnecessary swimming increases the rate of body heat loss. Keep the head out of the water. This will increase survival time.
- Keep a positive attitude about rescue. This will increase chances of survival.
- If there is more than one person in the water, huddling is recommended to conserve body heat.

4.7.3 If an employee or equipment is to work on ice and the water beneath the ice is or may be more than 3¼ feet (1m) deep at any point:

- Test the ice prior to commencing to ensure it will support the load to be placed on it. Ongoing testing may be necessary.
- If there is any risk of falling through the ice employees must wear personal protective equipment that will ensure buoyancy and protect against hypothermia at all times while on the ice.

4.8 Work-Warming Regimen

4.8.1 If work is performed continuously in the cold at an equivalent chill temperature (ECT) at or below 19ºF (–7ºC), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The employees should be encouraged to use these shelters at regular intervals; the frequency will depend on the severity of the environmental exposure. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.

4.8.2 The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter.

4.8.3 When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing should be loosened to permit sweat evaporation or a change of dry work clothing provided.

4.8.4 A change of dry work clothing should be provided as necessary to prevent employees from returning to the cold environment with wet clothing.

5.0 Records

5.1 Exposure assessments will be documented in the location's files.

6.0 Attachments

6.1 S3AM-112-ATT1 Temperature Thresholds

6.2 S3AM-112-ATT2 Symptoms & Treatment

Heat Stress

1.0 Purpose and Scope

1.1 Establishes a Heat Illness Prevention Program to guide employees in preventing heat illness, recognition of the symptoms of heat stress-related illnesses and in taking the appropriate corrective action.

1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

2.1 **Acclimated –** Employees who have developed physiological adaptation to hot environments characterized by increased sweating efficiency, circulation stability, and tolerance of high temperatures without stress. Acclimatization occurs after 7 to 10 consecutive days of exposure to heat and much of its benefit may be lost if exposure to hot environments is discontinued for a week.

2.2 **Chemical Protective Clothing (CPC)** – Apparel that is constructed of relatively impermeable materials intended to act as a barrier to physical contact of the Employee with potentially hazardous materials in the workplace. Such materials include Tyvek® coveralls (all types) and polyvinyl chloride coveralls and rain suits.

2.3 **Heat Cramps** – A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.

2.4 **Heat Exhaustion** – A form of heat stress brought about by the pooling of blood in the vessels of the skin and in the extremities.

2.5 **Heat Rash** – A heat-induced condition characterized by a red, bumpy rash with severe itching.

2.6 **Heat Stress** – The combination of environmental and physical work factors that constitute the total heat load imposed on the body.

2.7 **Heat Stroke** – The most serious form of heat stress, which involves a profound disturbance of the body's heat-regulating mechanism.

2.8 **Sunburn** – Caused by unprotected exposure to ultraviolet radiation present in sunlight that is damaging to the skin (Refer to *S3AM-121-PR1 Non-Ionizing Radiation*). The injury is characterized by red painful skin, blisters, and/or peeling.

2.9 **Unacclimated** – Employees who have not been exposed to hot work conditions for one week or more or who have become heat-intolerant due to illness or other reasons.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation

3.3 S3AM-010-PR1 Emergency Response Planning

3.4 S3AM-121-PR1 Non-Ionizing Radiation

3.5 S3AM-208-PR1 Personal Protective Equipment

3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedures

4.1 Roles and Responsibilities

4.1.1 Managers

- Evaluate the need for heat illness prevention measures and incorporate as appropriate into the Safe Work Plan or Task Hazard Analysis.
- Allocate sufficient resources for the management of heat illness in the field including the provision of water, a shaded break area, and sufficient schedule to allow for breaks.

4.1.2 Safety, Health and Environment (SH&E) Manager

- Provide heat illness awareness training.
- Assist in developing appropriate work-rest schedules.
- Conduct/support incident investigations related to potential heat stress-related illnesses.

4.1.3 Supervisor

- Identify those tasks that may be most impacted by heat stress and communicate the hazard to the assigned Employees.
- Confirm that Employees have been trained on the recognition of heat illness.
- Confirm that this procedure, along with any applicable Safe Work Plan and/or Task Hazard Analysis (and heat exposure control plan that may be contained therein) are made available to affected Employees.
- Confirm that adequate supplies of appropriate fluids are readily available to Employees.
- Confirm that a proper rest area is available.
- Conduct heat illness monitoring, as applicable.
- Implement the work-rest schedule.
- Confirm that first aid measures are implemented once heat stress symptoms are identified.
- Confirm personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.
- Report all suspected heat illnesses.

4.1.4 Employee

- Observe each other for the early symptoms of heat illnesses.
- Maintain an adequate intake of available fluids.
- Be familiar with heat stress hazards, predisposing factors, and preventative measures.
- Report to work in a properly vested and hydrated condition.
- Report all suspected heat stress-related illnesses.

4.2 Restrictions

4.2.1 The Buddy System is required when working in high heat conditions; Employees shall not work alone.

4.2.2 Employees shall not be exposed to levels exceeding those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Heat Stress – Temperature Thresholds*.

4.2.3 Clothing corrections shall be applied in accordance with the tables provided in *S3AM-113-ATT1 Heat Stress – Temperature Thresholds*.

4.3 Exposure Controls

4.3.1 It shall be determined whether Employees are or may be exposed to hazardous heat levels. The Supervisor shall:

- Conduct a heat stress assessment to determine the potential for hazardous exposure of Employees. Assessment shall include, but not limited to:
  - Ambient temperature.
  - Amount of sunshine (cloudy, clear). Refer to *S3AM-121-PR1 Non-Ionizing Radiation* additional direction concerning ultraviolet radiation exposures.
  - Other radiant heat sources (e.g. motor, fire, etc.).
  - Humidity.
  - Air flow.
  - Amount or type of physical labor being performed,
  - Physical condition of the Employees (e.g., acclimated/not)
  - Protective clothing in use.
  - Referral to *S3AM-113-ATT1 Heat Stress – Temperature Thresholds* to assist in determining whether hazardous heat exposures may exist.
- If potential for hazardous exposure is identified, the Supervisor shall develop and implement a heat stress exposure control plan within the Safe Work Plan and/or Task Hazard Analysis. Refer to *S3AM-209-PR1 Risk Assessment & Management.*

4.3.2 If Employees are or may be exposed, the Supervisor shall implement engineering controls (e.g., shelters, cooling devises, etc.) to reduce the exposure of Employees to levels below those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Heat Stress – Temperature Thresholds*.

4.3.3 If engineering controls are not practicable, the Supervisor shall reduce the exposure of Employees to levels below those listed in *S3AM-113-ATT1 Heat Stress – Temperature Thresholds* by providing administrative controls, including a work-rest cycle or personal protective equipment, if the equipment provides protection equally effective as administrative controls.

4.3.4 If Employees are or may be exposed, the Supervisor shall provide and maintain an adequate supply of cool, fresh, potable water close to the work area for the use of a heat exposed Employee. Water shall be provided (paid) by the project or program; if Employees purchase their own drinking water because water is not otherwise available on site, they shall be reimbursed.

4.3.5 If an Employee shows signs or reports symptoms of heat stress or strain, they shall be removed from the hot environment and treated by an appropriate first aid attendant on site, if available, or by a physician, refer to *S3AM-113-ATT2 Heat Stress – Symptoms & Treatment* for more specifics.

4.4 Heat Stress Planning

4.4.1 Heat stress can be a significant site hazard, especially for Employees wearing CPC. To prepare for emergency response planning, refer to *S3AM-010-PR1 Emergency Response Planning* procedure.

4.4.2 The project and site-specific heat related risks shall be identified. Appropriate prevention and control measures shall be developed and documented in the project's SH&E Plan or included as a supplement to the SH&E Plan (e.g., *S4[DCS]AM-113-FM1 Heat Illness Prevention Plan – DCS Americas*) and the Task Hazard Assessments (THA). Refer to the *S3AM-209-PR1 Risk Assessment & Management* procedure.

4.4.3 The heat a worker is exposed to may be a combination of air temperature, radiant heat, and humidity. The WBGT (wet-bulb globe thermometer) is a useful index of the environmental contribution to heat stress. Because WBGT is only an index of the environment, the contributions of work demands, clothing, and state of acclimatization shall also be accounted for, as described in the following steps.

- Monitor ambient temperatures and conduct heat stress monitoring in accordance with the location specific SH&E Plan. Revise the heat stress monitoring and controls if there are any reports of discomfort due to heat stress.
- Monitor temperatures in each unique environment in which workers perform work (e.g., take WBGT measurements inside truck cabs for truck drivers, and take separate WBGT measurements in the outdoor area where field employees work, etc.). Follow manufacturer's instructions on proper use of the WBGT.
- Determine if individual workers are acclimatized or un-acclimatized. Full heat acclimatization requires up to 3 weeks of continued physical activity under heat-stress conditions similar to those anticipated for the work. Its loss begins when the activity under those heat-stress conditions is discontinued, or when there is a sustained increase in temperatures of 10 °F (5.6 °C) or more, and a noticeable loss occurs after 4 days. A worker can be considered acclimatized for the purpose of this procedure when they have been exposed to the site conditions (including level of activity) for 5 of the last 7 days.
- Determine the approximate workload of each worker or group of workers. The following examples (Table 1) can be used for comparison:

Table 1
Examples of Activities within Workload Categories

Categories	Example Activities
Resting	Sitting quietly
	Sitting with moderate arm movements
Light	Sitting with moderate arm and leg movements
	Standing with light work at machine or bench while using mostly arms
	Using a table saw
	Standing with light or moderate work at machine or bench and some walking about
Moderate	Scrubbing in a standing position
	Walking about with moderate lifting or pushing
	Walking on level at 3.5 miles/hr (6 km/hr) while carrying 6.6 lbs (3kg) weight load
Heavy	Carpenter sawing by hand
	Shoveling dry sand
	Heavy assembly work on a non-continuous basis
	Intermittent heavy lifting with pushing or pulling (e.g., pick-and-shovel work)
Very Heavy	Shoveling wet sand

- Determine the approximate proportion of work within an hour during a typical shift. Typically, the initial work schedule will be 60 minutes of work per hour (100 percent work) with a small break in the morning and afternoon, as appropriate, and a 30-minute lunch break mid-day.
- For workers wearing cloth coveralls (e.g., Nomex fire resistant clothing), add 3 to the measured WBGT. For impermeable clothing, such as Tyvek or Saranex, the WBGT procedures cannot be used. For these situations, workers should begin physiological monitoring as soon as the temperature in the work area exceeds 70ºF (21°C).
- Use the collected information to develop appropriate work to rest schedules as detailed in *S3AM-113-ATT1 Heat Stress – Temperature Threshold*. Work-rest schedules and water provision shall be documented in the applicable SH&E Plan or supplementary Health Illness Prevention Plan and may be additionally documented using logs such *as S3AM-113-FM2 Daily Heat Illness Prevention Log*.

4.4.4 Given the work demands (light, moderate, heavy or very heavy), heat of the work environment, and such aspects as PPE in use, workload will be adjusted appropriately to allow for proper acclimation.

- This is the process by which the body "gets used to" hot work environments. This is achieved by slowly increasing workloads.
- New and returning Employees (absent one week or more) who have not had time to acclimatize may be more susceptible to heat related illnesses, even in seemingly low risk heat exposures.
- All Employees shall be allowed time to acclimatize in the event of a heat wave. All Employees assigned to a new process with additional heat exposures shall be allowed to acclimatize.
- Minimize workload and gradually increase as tolerance is built up. Allow for more frequent breaks.
- While acclimatization normally takes approximately 5 to 7 days, heightened monitoring of these Employees will be maintained for the first 14 days.

4.4.5 Employees shall be instructed in the recognition of heat stress symptoms, the first aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Employees shall be encouraged to immediately report any heat stress that they may experience or observe in fellow Employees. Supervisors shall use such information to adjust the work-rest schedule to accommodate such problems.

4.4.6 Wherever possible, a designated break area should be established in an air-conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow Employees to loosen or remove protective clothing, and sufficient seating should be available for all Employees. During breaks, Employees shall be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.

4.5 Symptoms and Treatment

4.5.1 Refer to *S3AM-113-ATT2 Heat Stress – Symptoms & Treatment*.

4.5.2 Employees who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin) shall be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water.

4.5.3 Severe heat stress (heat stroke) is a life-threatening condition requiring immediate emergency medical care (e.g., call 911). Anyone exhibiting symptoms of heat stroke (slurred speech, unconsciousness, etc.) shall be taken immediately to the nearest medical facility. Steps shall be taken to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.).

4.6 Prevention

4.6.1 Requirements for working in extreme heat may be triggered by regulatory established criteria (e.g. CAL/OSHA requires high heat procedures when temperature equals or exceeds 95°F) or as a result of a hazard analysis assessing various contributory factors (refer to *S3AM-113-ATT1 Heat Stress – Temperature Thresholds*). Employees working in extreme heat or sun should understand and apply the following guidelines for preventing and detecting heat exhaustion and heat stroke.

- When possible, begin hydrating at least three days prior to working in high heat conditions.
- Review the heat stress exposure control plan within the SH&E Plan, and/or Task Hazard Analysis.
- If the supervisor is not immediately available confirm a reliable method of communication is in place to allow for contact with supervision. In the absence of cellular reception, a satellite phone or similar device may be required.

- Take frequent short breaks in areas sheltered from direct sunlight; eat and drink small amounts frequently.
- Try to schedule work for the coolest part of the day, early morning and evening.
- Avoid strenuous physical activity outdoors during the hottest part of the day.
- Avoid sudden changes of temperature. Refer *to S3AM-113-ATT1 Heat Stress – Temperature Thresholds*.
- Air out a hot vehicle before getting into it.
- Obtain medical direction if taking diuretics during hot weather (a lower dose may be necessary).
- When working in heat, drink 1 quart of water per hour of work.
- Avoid caffeine and alcohol as they increase dehydration.
- Monitor urine frequency and color to detect dehydration. Refer to the *S3AM-113-ATT3 Dehydration Chart.*
- The Buddy System is required when working in high heat conditions to enable effective communication and cross-observation for indications of heat stress.
- Initiate emergency response procedures when necessary, including contacting emergency medical services as appropriate and in accordance with the Emergency Response Plan.

4.6.2 Personal Protective Equipment

- Review the *S3AM-208-PR1 Personal Protective Equipment* procedure.
- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Apply sunscreen to exposed skin (SPF 30 or greater, follow directions on label).
- Wear sunglasses with UV protection.
- Pack extra water to avoid dehydration (try freezing water in bottles overnight to help keep the water cooler for longer during the day).

4.7 Work-Rest Schedule Practices

4.7.1 Intake of fluid will be increased beyond that which satisfies thirst, and it is important to avoid "fluid debt," which will not be made up as long as the individual is sweating.

- Two 8-ounce glasses of water should be taken prior to beginning work, then up to 32 ounces (1 quart) per hour during the work shift; fluid replacement at frequent intervals is most effective.
- The best fluid to drink is water; liquids like coffee or soda do not provide efficient hydration and may increase loss of water.
- If commercial electrolyte drinks (e.g., Gatorade) are used, the drink should be diluted with water, or 8 ounces of water should be taken with each 8 ounces of electrolyte beverage.

4.7.2 Additional salt is usually not needed and salt tablets should not be taken.

4.7.3 Fluids for drinking should be cool and fresh, but not cold.

4.7.4 Breaks will be taken in a cool, shaded location, and any impermeable clothing should be opened or removed.

- A relatively cool, shaded area shall be provided for breaks when working in hot environments. For hazardous waste sites, the rest area should be located in the support zone adjacent to the contamination reduction zone, situated so that part of it is in the decontamination area so workers can take breaks without going through full decontamination.

- If shade is not available, shaded areas shall be constructed. This same type of canopy can be set up to shade personnel performing various types of work in hot weather.
- Cooling measures other than shade (e.g., misting, air-conditioned break areas, air conditioned vehicles, etc.) can be used in lieu of shade provided it can be demonstrated that they are at least as effective in cooling employees.
- Employees should have access to these rest areas at break times and at any other time when suffering from heat illness or believing a preventive recovery period is needed.

4.7.5 Dry clothing or towels should be available to minimize chills when taking breaks.

4.7.6 Manual labor will not be performed during breaks, other than paperwork or similar light tasks.

4.7.7 Other controls that may be used include:

- Scheduling work at night or during the cooler parts of the day (6 am–10 am, 3 pm–7 pm).
- Erecting a cover or partition to shade the work area.
- Auxiliary cooling - wearing cooling devices beneath protective garments, but over any underclothing.
  - If cooling devices are worn, only physiological monitoring will be used to determine work activity.
  - These vests typically provide cooling via one of two methods: the use of ice or other frozen media, or the use of a vortex cooler. Each method has its advantages and disadvantages.
  - The frozen media vest requires a means for freezing the media, and the media (usually water or "blue ice") will melt, requiring replacement.
  - The vortex cooler tends to cool more uniformly. Instead of frozen media, this vest uses the expansion of compressed air to cool the wearer. The drawback is the compressed air requirement, but this is negated when the wearer is already using an airline respirator supplied by a compressor. A vortex cooler should not be supplied from air cylinders, as this will draw down the cylinders rapidly.
- Auxiliary cooling should be considered when the following conditions exist:
  - Ambient temperature over 80°F (26°C).
  - Workers are wearing impermeable garments (i.e., Tyvek, Saranex, Chemrel, etc.).
  - It is desirable to have long work shifts with minimum interruption.

4.8 Evaluating the Work-Rest Schedule's Effectiveness

4.8.1 Once a work-rest schedule is established, the Supervisor shall continually evaluate its effectiveness through observation of Employees for signs/symptoms of heat stress. Have workers assess themselves and their body's reaction to the heat and work conditions (self-assessment), and report any signs or symptoms of heat illness. These can include nausea or dizziness, heat cramps, extreme thirst, or very dark urine.

4.8.2 Measurement or physiological monitoring of each Employee's vitals (e.g., pulse, blood pressure, and temperature) can provide additional information in determining if the schedule is adequate. Refer to *S3AM-113-ATT1 Heat Stress – Temperature Thresholds* for additional guidance on when physiological monitoring should be conducted.

4.8.3 Frequency of physiological monitoring is increased or decreased depending upon such factors as worker fitness, acclimatization, temperature of the work environment, type of PPE, etc.

Based on the results of the physiological monitoring and on the workers' self-assessments, the work period may be adjusted as follows:

- The work period may be increased (generally, by 5- to 10-minutes intervals, up to a maximum of 4 hours) if the results of the first 2 hours of the physiological monitoring and the workers' self-assessments indicate that workers are recovering adequately (see below), and on the judgment of the SH&E Manager.
- The work period shall be decreased if the results of the physiological monitoring and the workers' self-assessment indicate that workers are NOT recovering adequately (see below).

4.8.4 If physiological monitoring is conducted, the Employee and/or the SH&E Manager (or appropriate designate) shall measure and record body temperature and pulse rate as described below.

4.8.5 Monitor body temperature to determine if Employees are adequately dissipating heat build-up. Ear probe thermometers which are adjusted to oral temperature (aural temperature) are convenient and the preferred method of measurement. Determine work/rest regimen as follows:

- Measure oral body temperature at the end of the work period. Oral body temperatures are to be obtained prior to the employee drinking water or other fluids.
- If temperature exceeds 99.6°F (37.5°C), shorten the following work period by 1/3 without changing the rest period.
- If, at the next rest period, temperature still exceeds 99.6°F (37.5°C), the worker should not be allowed to continue work until repeated temperature measurements are in the acceptable range (i.e., less than 99.6°F). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.
- Do not allow a worker to wear impermeable PPE when his/her oral temperature exceeds 100.6°F (38.1°C).

4.8.6 At the start of the workday each Employee's baseline pulse rate (in beats per minute [bpm]) is determined by taking a pulse count for 15 seconds and multiplying the result by four or by using an automated pulse count device. Pulse rates can then be measured at the beginning of each break period and two minutes thereafter to determine if the rest period allows for adequate recovery.

- Take the radial (wrist) pulse as early as possible in the rest period and determine the worker's heart rate in beats per minute. The heart rate is determined by counting the pulse for ten seconds and multiplying the number by 6 to get the beats per minute. Record this as P1.
- Wait 2 minutes and repeat the pulse measurement. Record this as P2.
- If P1 is greater than or equal to 110 beats per minute (bpm) and if (P1 – P2) is less than or equal to 10 bpm (indicating that workers are not recovering adequately), shorten the next work cycle by 1/3 without changing the rest period.
- At the next rest period, if P1 is still equal to or greater than 110 bpm, and if (P1 – P2) is still less than or equal to 10 bpm, shorten the following work cycle by 1/3 without changing the rest period.
- At the third rest period, if P1 is still equal to or greater than 110 bpm and (P1 – P2) is still less than or equal to 10 bpm, the worker should not be allowed to continue work until repeated pulse measurements are in the acceptable range (i.e., P1 is less than 110 bpm and (P1 – P2) is greater than 10 bpm). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.

4.8.7 Use of an automated or similar blood pressure device will be used to assess each Employee's blood pressure at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:

- If the blood pressure of an Employee is outside of 90/60 to 150/90, then the Employee will not be allowed to begin or resume work; extend the break period by at least five minutes, at the end of which blood pressure rates will be re-measured and the end-of-break criteria again applied.

4.8.8 All physiological monitoring of heat stress will be documented using *S3AM-113-FM1 Heat Stress Monitoring Log.*

4.9 Training

4.9.1 Employees and their Supervisors that may be exposed to the hazard will be trained and oriented to the hazard and the controls prior to work commencing.

4.9.2 Those Employees, including Supervisors, potentially exposed to heat stress will receive training, refer to the *S3AM-003-PR1 SH&E Training* procedure. Training will include, but is not limited to:

- Sources of heat stress (environmental and personal), influence of protective clothing, and importance of acclimatization;
- How the body handles heat and acclimatization;
- Recognition of heat-related illness symptoms;
- Preventative/corrective measures including, but not limited to;
  - Employees will be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.
  - All Employees will be informed of the importance of adequate rest and proper diet in the prevention of heat stress.
- First aid procedures for heat stress-related illnesses; and
- Immediate reporting of any heat-related incident (injury, illness, near-miss), refer to the *S3AM-004-PR1 Incident Reporting, Notifications & Investigation* procedure.

5.0 Records

5.1 None

6.0 Attachments

6.1 S3AM-113-ATT1 Heat Stress - Temperature Thresholds

6.2 S3AM-113-ATT2 Heat Stress - Symptoms & Treatment

6.3 S3AM-113-ATT3 Dehydration Chart

6.4 S3AM-113-FM1 Heat Stress Monitoring Log

6.5 S3AM-113-FM2 Daily Heat Illness Prevention Log

6.6 S3[DCS]AM-113-FM1 Heat Illness Prevention Plan – DCS Americas

Americas

Heavy Equipment

S3AM-309-PR1

1.0 Purpose and Scope

1.1 Outline the safe working requirements for working with and near heavy equipment and heavy equipment operation.

1.2 Military related vehicles and equipment (e.g. tanks) are not covered under this standard.

1.3 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

2.1 **Heavy equipment** –All excavating equipment (e.g. scrapers, loaders, crawler or wheel tractors, excavators, backhoes, bulldozers, graders, agricultural and industrial tractors, etc.), cranes, lift trucks, drills, etc. This may include off-highway trucks (e.g. dump truck, heavy haul truck, etc.). For requirements related to crew trucks refer to *S3AM-005-PR1 Driving*.

2.2 **Operator** – Any person who operates the controls while the heavy equipment is in motion or the engine is running.

2.3 **Ground personnel/workers** – Personnel performing work on the ground around heavy equipment (note: operators are considered ground personnel when outside of the equipment cab).

3.0 References

3.1 S3AM-005-PR1 Driving

3.2 S3AM-202-PR1 Competent Person Designation

3.3 S3AM-213-PR1 Subcontractor Management

3.4 S3AM-303-PR1 Excavation

3.5 S3AM-322-PR1 Overhead Lines

3.6 S3AM-325-PR1 Lockout Tagout

3.7 S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers / Supervisors**

- Responsible for confirming all equipment is in good working order and all equipment operators are verified as qualified on the piece of machinery they are assigned.
- As applicable, review as-built drawings.
- Maintain operation manuals at the site for each piece of equipment that is present on the site and in use.
- Maintain a list of operators for the project, and the specific equipment that they are authorized to operate.
- Prohibit equipment from being operated by any personnel who have not been specifically authorized to operate it.

- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Confirm subcontractors are properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management.*
- Require that subcontractor employees follow established safety procedures in operation, inspection, and maintenance of vehicles and equipment.
- Inform AECOM and subcontractor machinery operators about applicable local regulations restricting the consecutive minutes of engine idling time allowed.
- Confirm subcontractor machinery and mechanized equipment is approved for use in accordance with the requirements of *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*.
- Confirm that all rented equipment bears any required current certification marks and arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Confirm that AECOM and subcontractor machinery and mechanized equipment is certified, as applicable, in accordance with manufacturer specifications and/or regulatory requirements.
- Visually observe the subcontractors' vehicles and equipment, for any unsafe conditions or practices. Equipment or operation not in compliance with applicable safety standards is prohibited.

4.1.2 **Employees / Ground Personnel**

- Confirm that all rented equipment arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Ground personnel when working in the vicinity of heavy equipment shall have received training, and comply with the applicable rules of engagement.

4.1.3 **Operators (of heavy equipment)**

- Operate the equipment safely, maintain full control of the equipment, and comply with manufacturer's operation manual and the laws governing the operation of the equipment.
- Inspect equipment and immediately report defects and conditions affecting the safe operation of the equipment to the appropriate Supervisor.
- Trainees may operate equipment in accordance with jurisdictional requirements and under the direct supervision of a trainer.

4.2 Communication

4.2.1 Communication between site Managers / Supervisors, heavy equipment Operators, and site Employees / Ground Personnel is a key method of preventing serious injury or death during heavy equipment operations.

4.2.2 Managers shall confirm the Industrial site or project specific SH&E Plan is developed and communicated to all affected and involved employees. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.2.3 Task Hazard Assessments and Daily Tailgate meetings shall be conducted in accordance with *S3AM-209-PR1 Risk Assessment & Management.*

4.2.4 Concerning worksites in which other employers control concurrent operations and SH&E issues related to the worksite, the manager shall coordinate with those conducting concurrent operations to confirm appropriate control measures are in place to protect employees from the hazards associated with activities to be performed.

- Coordination shall occur prior to work commencing, periodically thereafter, and as necessary given changes in scope and/or working conditions.
- Affected employees (including managers and supervisors) shall seek to participate in all site SH&E meetings related to concurrent operations.

4.2.5 The following points outline the communication requirements during heavy equipment operations:

- Site Supervisors/t Managers shall confirm that all operators are notified/informed of when, where, and how many ground personnel will be working on site.
- Site Supervisors/ Managers shall inform all ground personnel before changes are made in the locations of designated work areas.
- Prior to work initiating on site, the Site Supervisor/ Manager is to confirm all operators and ground personnel are trained on the hand signals that will be used to communicate between operators and ground personnel.
- Ground Personnel working around heavy equipment operations are to maintain eye contact with operators to the greatest extent possible (always face equipment). Never approach equipment from a blind spot or angle.
- All heavy equipment whose backup view can be obstructed shall be equipped with reverse warning devices (e.g., backup alarms) that can be significantly heard over equipment and other background noise. Reverse signaling lights shall be in working order.
- When feasible, two-way radios shall be used to verify the location of nearby ground personnel.
- When an operator cannot adequately survey the working or traveling zone, a signal person shall use a standard set of hand signals to provide directions. Flags or other high visibility devices may be used to highlight these signals.

4.3 Ground Personnel

4.3.1 Ground clearance around heavy equipment may significantly reduce hazards posed during heavy equipment operations.

4.3.2 The following points outline the clearance requirements during heavy equipment operations:

- Ground Personnel shall always yield to heavy equipment.
- Ground Personnel shall maintain a suitable “buffer” area of clearance from all active heavy equipment.
- A task hazard assessment that identifies any special precautions shall be completed and communicated to all AECOM personnel associated with or affected by the activity.
- Site Supervisors/ Managers shall designate areas of heavy equipment operation and confirm that all ground personnel are aware of designated areas.
    - Designated areas shall include work zone boundaries and travel routes for heavy equipment.
    - Travel routes shall be set up to reduce crossing of heavy equipment paths and to keep heavy equipment away from ground personnel.
    - Work zone boundaries shall consider line of fire hazards related to the equipment and associated activities. Refer also to *S3AM-309-ATT2 Operator Line of Sight.*
    - If working near heavy equipment, Ground Personnel shall stay clear of loads to be lifted or suspended loads, and out of the travel and swing areas (excavators, all-terrain forklifts, hoists, etc.) of all heavy equipment.
    - During winch use, all swampers or other personnel will remain outside the “whip area” of the winch line or tow cable.

  - At a minimum, employees shall maintain a distance of at least two pile lengths from where piles are being cut and dropped, other than in situations where cut piles are being guided to the ground utilizing mechanical means (e.g., pile driver and shackle) to control the direction and speed of fall of the cut pile.
- When feasible, Site Supervisors/ Managers shall set up physical barriers (e.g., caution tape, orange cones, concrete jersey barriers) around designated areas and confirm that unauthorized ground personnel do not enter such areas.
- Operators shall stop work whenever unauthorized personnel or equipment enter the designated area and only resume when the area has been cleared.
- Operators shall only move equipment when aware of the location of all workers and when the travel path is clear.
- Ground Personnel shall never stand between two pieces of operating heavy equipment or other objects (e.g., steel support beams, trees, buildings, etc.).
- Ground Personnel shall never stand directly below heavy equipment located on higher ground unless it can be verified ground stability is not a factor and grade of slope is such that it would not contribute to equipment tip-over.
- Ground Personnel may only enter the swing area, work area or path of travel of any operating equipment when:
  - They have attracted the operator's attention and established eye contact, and
  - The operator has idled the equipment down, placed it in neutral, grounded engaging tools, set brakes and communicated entry is permitted.
- Employees shall keep all extremities, hair, tools, and loose clothing away from pinch points and other moving parts on heavy equipment.
- Employees shall not talk, text, or otherwise use a cell phone while standing or walking on a roadway or other heavy equipment path.

4.3.3 At a minimum, all Ground Personnel and Operators outside of heavy equipment shall wear the following:

- High visibility safety vest (fluorescent background material and retro-reflective striping) meeting jurisdictional requirements that is visible from all angles.
  - Background material: should be fluorescent yellow-green, fluorescent orange-red or fluorescent red.
  - Combined-performance retro-reflective material (e.g. the stripes): should be fluorescent yellow-green, fluorescent orange-red or fluorescent red - and shall be in contrast (that is, have a distinct color difference) to the background material.
  - Hazards may require high visibility garments that cover torso, legs and arms.
  - Confirm that vest is not faded or covered with outer garments, dirt, etc.
- American National Standards Institute/Canadian Standards Association- (ANSI/CSA-) approved hard hat
- ANSI/CSA-approved safety glasses with side shields
- At a minimum, CSA or ASTM approved, high-cut (min. 6"), puncture, impact and compression resistant footwear.
- ANSI/CSA-approved hearing protection as needed
- Appropriate work clothes (e.g., full-length jeans/trousers and a sleeved shirt; no tank, crew tops or other loose clothing permitted).

4.4 Prior to work commencing

4.4.1 All heavy equipment will be inspected pre-shift and then regularly as required with the details of the inspection recorded in a log book.

- Roll-over protection systems (ROPS) and appropriate overhead protection (Fall Object Protection FOP) shall be in place given the specific equipment requirements. Utilize equipment with enclosed cabs where feasible or accessible.
  - o Where use of equipment with enclosed cabs is not feasible or said equipment is not accessible, operators shall use any additional personal protective equipment determined as necessary (e.g. goggles, additional hearing protection, etc.).
- Equipment operated in hazardous atmosphere environments shall be equipped with the proper safety equipment (e.g., spark arrestors, positive air shut off, etc.).
- Operation of equipment that has or had cab glass (per the manufacturer's specifications) that is cracked/broken (obstructing the operator's view) or missing is prohibited.
- A locking device shall be provided that will prevent the accidental separation of towed and towing vehicles on every fifth-wheel mechanism and two-bar arrangement.
- Trip handles for tailgates of dump trucks and heavy equipment shall be arranged so that when dumping, the operator will be in the clear.
- The Operator will report defects and conditions affecting the safe operation of the equipment to the Site Supervisor or employer. Any repair or adjustment necessary for the safe operation of the equipment will be made before the equipment is used.
- Exposed moving parts on heavy equipment (belts, gears, shafts, pulleys, sprockets, spindles, drums, fan belts, flywheels, chains, or other reciprocating, rotating or moving parts) which are a hazard to the operator or to other workers will be guarded.
  - o If a part will be exposed for proper function it will be guarded as much as is practicable consistent with the intended function of the component.

4.4.2 An approved 4A40BC fire extinguisher shall be present on all heavy equipment. An approved 4A40BC fire extinguisher of appropriate rating shall be present and readily accessible on all heavy equipment.

- Fire extinguishers shall be inspected by the operator prior to heavy equipment operation each shift. Monthly and annual inspections shall be documented.

4.4.3 All Operators shall inspect the area adjacent to the machine prior to starting.

- Evaluate ground conditions, concurrent operations and obstructions to identify approved routes of travel and work areas.
- As applicable, check that there is sufficient swing room and that the outriggers are adequately supported on solid and stable ground

4.4.4 Managers / Supervisors shall inform the operators of the equipment that AECOM employees are in the area and inquire if there are any restricted areas or specific rules or requirements. In some industrial facilities, heavy equipment has the 'right of way'.

4.4.5 Where the Operator will not have a full view of the path of travel, a signal person will be used on the ground that has a full view of the load, the operator, and the path.

4.4.6 All heavy equipment with limited visibility (operator cannot directly or by mirror or other effective device see immediately behind the machine) operated around workers or on a construction site:

- Shall have an audible back-up alarm installed that functions automatically when the vehicle or equipment is put into rear motion.

- All bi-directional equipment shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction.
- Backing up or movement in both directions for bidirectional equipment shall occur only when a signal person communicates that it is safe to do so if alarms or horns are not feasible.

4.5 Operation

4.5.1 The Operator of heavy equipment is the only worker permitted to ride the equipment unless the equipment is equipped by the manufacturer for passengers. Manufacturer operator’s manual shall be complied with.

4.5.2 A person will not operate heavy equipment unless the person has received adequate instruction and training in the safe use of the equipment, and has demonstrated to a qualified supervisor or instructor competency in operating the equipment.

- Oilers, apprentices, and other operators will not be allowed to operate equipment unless authorized by the Manager.

4.5.3 The Operator of heavy equipment will operate the equipment safely, maintain full control of the equipment, and comply with the manufacturer’s operator manual and the laws governing the operation of the equipment.

- Operation of company-owned, leased, or rented vehicles or equipment while under the influence of alcohol or illegal drugs or otherwise impaired is prohibited.
- Do not operate any equipment beyond its safe load or operational limits.
- Operator shall not talk on, text, or otherwise use mobile phones while operating heavy equipment.
- Never use bucket teeth or boom for lifting or moving heavy objects.

4.5.4 When heavy equipment is used for lifting or hoisting or similar operations there shall be a permanently affixed notation stating the safe working load capacity of the equipment and the notation shall be kept legible and clearly visible to the operator.

4.5.5 A Supervisor or Manager will not knowingly operate or permit a worker to operate heavy equipment which is, or could create, an undue hazard to the health or safety of any person. Where compliance is refused, the Manager or his or her designate should be notified immediately.

4.5.6 The Operator of heavy equipment will not leave the controls unattended unless the equipment has been secured against inadvertent movement.

- The Operator is not to leave suspended load, machine or part or extension unattended, unless it has been immobilized and secured against inadvertent movement.
- Turn off heavy equipment, place gear in neutral and set parking brake prior to leaving vehicle unattended.
- Buckets and blades are to be placed on the ground and with hydraulic gears in neutral when not in use.
- Brakes shall be set and, as necessary, wheels chocked or equivalent (as applicable) when not in use.

4.5.7 The Operator will maintain the cab, floor and deck of heavy equipment free of material, tools or other objects which could create a tripping hazard, interfere with the operation of controls, or be a hazard to the operator or other occupants in the event of an accident.

4.5.8 If heavy equipment has seat belts required by law or manufacturer’s specifications, the Operator and passengers will use the belts whenever the equipment is in motion, or engaged in an operation which could cause the equipment to become unstable.

- Seat belts shall be maintained in functional condition, and replaced when necessary to ensure proper performance.

4.5.9 All vehicles transporting material or equipment on public roads shall comply with local laws pertaining to weight, height, length, and width. Obtain any permits required for these loads.

4.5.10 Never jump on to or off of a piece of heavy equipment, always maintain 3-points of contact at a minimum.

4.5.11 Never exit heavy equipment while it is in motion.

4.5.12 Do not ride with arms or legs outside of the truck body of equipment cab.

- Never ride on the outside of a piece of heavy equipment (e.g. in a standing position on the body, on running boards, or seated on side fenders, cabs, cab shields, rear of truck bed, on the load, bucket, etc.).

4.5.13 Have vehicle headlights on at all times when driving in the area.

4.5.14 Park motor vehicles off the haul roads, or away from the work areas.

4.5.15 Do not wear loose clothing or jewelry where there is a danger of entanglement in rotating equipment.

4.5.16 Do not enter the swing area of machines such as cranes, heavy drill rigs, or excavators, without first making eye contact with the operator, and receiving permission to do so. Refer to *S3AM-309-ATT2 Operator Line of Sight.*

4.5.17 Stay out of the blind areas around heavy equipment and never assume that the equipment operators have seen you or are aware of your presence.

4.5.18 Maintain a distance of at least 2 feet (60 centimeters) between the counterweight of swing machines and the nearest obstacle. If this distance cannot be maintained, a spotter shall observe and be in constant communication with the operator to prevent contact.

4.5.19 Vibrations from moving traffic or heavy equipment can cause excavations or spoil piles to become unstable.

- Excavation activity shall be conducted according to *SOP S3AM-303-PR1 Excavation*.
- Equipment not involved in the excavating activity or not required to be in the vicinity shall keep clear. Equipment that shall operate in the vicinity shall maintain appropriate setback distances from edges of excavations or spoil piles.

4.5.20 All heavy equipment shall be operated in a safe manner that will not endanger persons or property.

- When ascending or descending grades in excess of 5 percent, loaded equipment shall be driven with the load upgrade.
- When operating an electric-powered, remote controlled, hydraulic device used for demolishing concrete structures and refractory linings as well as excavating, refer to the *S3AM-309-ATT1 Brokk 180* for more specifics.

4.5.21 All heavy equipment shall be operated at safe speeds. Do not drive any vehicle at a speed greater than is reasonable and safe for weather conditions, traffic, intersections, width, and character of the roadway, type of motor vehicles, and any other existing condition.

4.5.22 Always move heavy equipment up and down the face of a slope. Never move equipment across the face of a slope.

4.5.23 Slow down and stay as far away as possible while operating near steep slopes, shoulders, ditches, cuts, or excavations.

4.5.24 When feasible, Operators shall travel with the “load trailing”, if the load obstructs the forward view of the operator.

4.5.25 Slow down and sound horn when approaching a blind curve or intersection. Signal people equipped with 2-way radio communications may be required to adequately control traffic.

4.5.26 All haulage equipment / trucks, whose payload is loaded by means of cranes, power shovels, loaders, or similar equipment, shall have a cable shield and/or canopy adequate to protect the operator from shifting or falling material. If protection is not available for the operator, the operator shall leave the vehicle and wait in a designated safe location until it is loaded..

4.5.27 Equipment shall be shut down prior to and during fueling.

- Confirm proper grounding/ bonding between equipment and fuel vehicle prior to fueling operations.
- During fuel operations confirm fuel nozzle remains in contact with the tank.
- Do not smoke, use electrical devices or have an open flame present while fueling.
- Fuel shall not be carried in or on heavy equipment, except in permanent fuel tanks or approved safety cans.

4.5.28 Site vehicles will be parked in a designated parking location away from heavy equipment.

4.5.29 Operators shall never push/pull “stuck” or “broken-down” equipment unless a spotter determines that the area is cleared of all personnel around and underneath the equipment.

4.5.30 If designated for work in contaminated areas/zones, equipment shall be kept in the exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas.

4.5.31 Equipment left unattended at night adjacent to travelled roadways shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of that equipment, and shall not be closer than 6 feet (1.8m) (or the regulatory requirement for the work location) to the active roadway.

4.5.32 Rubber / pneumatic-tired earthmoving haulage equipment shall be equipped with fenders on all wheels. Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.

4.5.33 Lift trucks shall have the rated capacity clearly posted on the vehicle, and the ratings are not to be exceeded.

4.5.34 Steering or spinner knobs shall not be attached to steering wheels.

4.5.35 High-lift rider industrial trucks shall be equipped with overhead guards.

4.5.36 All hot surfaces of equipment, including exhaust pipes or other lines, that present a possible injury or fire hazard, shall be guarded or insulated.

4.5.37 All equipment having a charging skip shall be provided with guards on both sides and open end of the skip area to prevent persons from walking under the skip while it is elevated.

4.5.38 Platforms, foot walks, steps, handholds, guardrails, and toeboards shall be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.

4.5.39 Substantial overhead protection shall be provided for the operators of fork lifts and similar equipment.

4.5.40 In an effort to reduce air emissions, fuel costs, and run-time hours (that can impact equipment warranty), operators shall limit heavy equipment engine idling to not more than five consecutive minutes. Local regulations at the location of the vehicle operation could require less than five consecutive minutes idling time. The idling limit does not apply to:

- Idling when queuing.
- Idling to verify that the vehicle is in safe operating condition.

- Idling for testing, servicing, repairing or diagnostic purposes.
- Idling necessary to accomplish work for which the vehicle was designed (cranes, man-lifts, forklifts, etc.)
- Idling required to bring equipment/vehicle to operating temperature, as specified by the manufacturer. Engine heaters shall be used for cold weather starting to avoid engine idling where feasible.
- Idling necessary to ensure safe operation of the vehicle.
- Idling to keep equipment (including windows) clear of ice and snow.
- Idling to provide air conditioning or heat to ensure the health and safety of the operator, but only when seated inside the equipment or vehicle.

4.6 Utilities

4.6.1 When contacted by heavy equipment, aboveground and underground utilities may cause severe injuries or death as a result of electrocution, explosion, etc. Refer to the *S3AM-322-PR1 Overhead Lines* procedure for more specifics.

4.6.2 The following outline the requirements while performing heavy equipment operations that may lead to contact with aboveground or underground utilities:

- Always be aware of surrounding utilities.
- Confirm all equipment (e.g., dump trailers, loaders, excavators, etc.) is lowered prior to moving underneath aboveground utilities.
- Confirm utilities are cleared and identified prior to beginning any earthmoving operation. Contact the local utility service providers for clearance prior to performing work. Confirm documentation of the contact is made; date, number; contact name, organization, etc. Refer to *SOP S3AM-303-PR1 Excavation* and *S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance.*

4.7 Training

4.7.1 The Operator or other qualified supervisor will provide all on-site personnel with an orientation to the heavy equipment and its associated hazards and controls.

4.7.2 Only designated, qualified personnel shall operate heavy equipment.

4.7.3 Operators shall have all appropriate jurisdictional licenses or training to operate a designated piece of heavy equipment.

4.7.4 Operators shall be evaluated through documented experience and routine monitoring of activities unless the equipment is operated by an AECOM operator in which case a practical evaluation is required. Operators shall be knowledgeable and competent in the operation of a designated piece of heavy equipment.

4.8 Inspection and Maintenance

4.8.1 Maintenance records for any service, repair or modification which affects the safe performance of the equipment will be maintained and be reasonably available to the operator and maintenance personnel regulatory agencies upon request during work hours.

4.8.2 Maintenance records will be maintained on the site or project for heavy equipment.

4.8.3 Conduct maintenance as prescribed by the manufacturer in the Operation Manual for each piece of equipment.

4.8.4 Servicing, maintenance and repair of heavy equipment will not be done when the equipment is operating.

- Lockout and tagout safety procedures are followed. Refer to *S3AM-325-PR1 Lockout Tagout*.

- Motors are turned off, unless required for performing maintenance or repair.
- All ground-engaging tools are grounded or securely blocked.
- Controls are set in a neutral position and brakes are set.
- Electrically driven equipment is installed with provision for tagging and locking out the controls while under repair.
- Manufacturer's requirements for maintenance and repair are followed.
- If continued operation is essential to the process, a safe means of protection shall be provided.
- Provide and use a safety tire rack, cage, or equivalent protection when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

4.8.5 All heavy equipment shall have a documented inspection and if necessary, repaired prior to use.

- Operators shall not operate heavy equipment that has not been cleared for use.
- All machinery and mechanized equipment will be verified to be in safe operating condition (refer to *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*) by a competent person (refer to *S3AM-202-PR1 Competent Person Designation*) within seven days prior to operation on a new site or project. Clearance is valid for up to one year for the given site or project.
- As applicable, all machinery and mechanized equipment shall be inspected / certified and tested at appropriate intervals as required by the manufacturer and/or regulatory requirements.

4.8.6 All heavy equipment shall be inspected at a minimum to the manufacturer's recommendations prior to each work shift. All defects shall be reported to the Supervisor/ Manager immediately.

- Defective heavy equipment shall be immediately tagged and taken out of service until repaired.
- Inspection, maintenance, service and repair records shall be maintained at the site. If a manufacturer's or company-specific inspection checklist is not provided, use *S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist*.
- Records shall be made available for review upon request. Note: Documents may be electronically stored in the project files.

4.9 Fueling and batteries

4.9.1 A well-ventilated area shall be used for refueling.

4.9.2 Only the type and quality of fuel recommended by the engine manufacturer shall be used.

4.9.3 Fuel tanks shall not be filled while the engine is running. All electrical switches shall be turned off.

4.9.4 If there is potential to spill fuel on hot surfaces, the surfaces shall be permitted to cool down prior to fueling. Any spillage shall be cleaned before starting engine.

4.9.5 Spilled fuel shall be cleaned with cotton rags or cloths and disposed of in the proper receptacle; do not use wool or metallic cloth.

4.9.6 Open flames, lighted smoking materials, sparking equipment or any other type of ignition source shall remain a minimum of 35' (10.7m) from the fueling area and/or fuel source. This clearance shall be increased if required or conditions warrant.

4.9.7 Heaters in carrier cabs shall be turned off when refueling the carrier or the drill rig.

4.9.8 Portable containers to be filled shall be placed directly on the ground or be properly grounded prior to filling to prevent creation of a static charge. Portable fuel containers shall not be filled completely to allow expansion of the fuel during temperature changes.

4.9.9 Control electrostatic hazards.

- Before activating fuel pump, touch some part of vehicle / equipment to de-energize any static electricity that may be present.
- The fuel nozzle shall be kept in contact with the tank being filled to prevent static sparks from igniting the fuel.
- Fuel containers and transfer hoses shall be kept in contact with a metal surface during travel to prevent build-up of a static charge.

4.9.10 Portable fuel containers shall not travel in the vehicle or carrier cab with personnel.

4.9.11 Batteries shall be serviced in a ventilated area while wearing appropriate Personal Protective Equipment.

4.9.12 When a battery is removed from a vehicle or service unit, the battery shall be disconnected ground post first. Consult the SDS applicable to the battery and/or contents for additional information including; handling, precautions, and first aid measures.

- Spilled battery acid shall be immediately flushed off the skin with a continuous supply of water. Battery storage or maintenance areas shall have readily accessible eye wash stations.
- Should battery acid get into the eyes, the eyes shall be flushed immediately with copious amounts of water and medical attention shall be sought immediately.

4.9.13 When installing a battery, the battery shall be connected ground post last.

4.9.14 When charging a battery, cell caps shall be loosened prior to charging to permit gas to escape.

4.9.15 When charging a battery, the power source shall be turned off to the battery before either connecting or disconnecting charger loads to the battery posts.

4.9.16 To avoid battery explosions, the cells shall be filled with electrolytes. A flashlight (not an open flame) shall be used to check water electrolyte levels. Avoid creating sparks around batteries by shorting across a battery terminal. Lighted smoking materials and flames shall be kept at least a minimum of 35 feet (10.7 meters) away from battery-charging stations.

5.0 Records

5.1 Inspection, maintenance, service and repair records shall be maintained with the equipment.

6.0 Attachments

6.1 S3AM-309-ATT1 Brokk180 Safety Card

6.2 S3AM-309-ATT2 Operator Line of Sight

6.3 S3AM-309-FM1 Approval of Machinery & Mechanized Equipment

6.4 S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist

6.5 S3AM-309-FM3 Rubber Tire Backhoe Operator Skill Evaluation

6.6 S3AM-309-FM4 Scraper Operator Skill Evaluation

6.7 S3AM-309-FM5 Bull Dozer Operator Skill Evaluation

6.8 S3AM-309-FM6 Dump Truck Operator Skill Evaluation

6.9 S3AM-309-FM7 Roller Compactor Operator Skill Evaluation

6.10 S3AM-309-FM8 Front End Loader Operator Skill Evaluation

6.11 S3AM-309-FM9 Grader Operator Skill Evaluation

6.12 S3AM-309-FM 10 Excavator Operator Skill Evaluation

6.13 S3AM-309-FM11 Water Truck Operator Skill Evaluation

6.14 S3AM-309-FM12 Heavy Equipment Maintenance Inventory

6.15 S3AM-309-FM13 Heavy Equipment Inspection Report

Wildlife, Plants & Insects

S3AM-313-PR1

1.0 Purpose and Scope

1.1 Communicates the requirements and precautions to be taken by AECOM employees to protect against the biological hazards associated with insects, arachnids, snakes, poisonous plants, and other animals referred to herein collectively as “biological hazards”.

1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document’s content.

2.0 Terms and Definitions

2.1 **Field Work –** Any activity conducted at a site that contains brush, overgrown grass, leaf litter, poisonous plants, or is located near mosquito breeding areas and includes work in structures where animals might exist that harbor fleas or ticks or where spiders and mites could be present. Field work includes, but is not limited to, Phase I, Phase II, Operations Monitoring & Maintenance, biological surveys, and other work that meets the definition of field work.

2.2 **Poisonous** – Capable of harming or killing by or as if by poison; toxic or venomous.

2.3 **Phase I Environmental Site Assessment –** Investigation of real property to determine the possibility of contamination, based on visual observation and property history, but no physical testing. Under new Environmental Protection Agency regulations that went into effect on November 1, 2006, a Phase I, as it is called for short, will be mandatory for all investors who wish to take advantage of Comprehensive Environmental Response, Compensation, and Liability Act defenses that will shield them from liability for future cleanup, should that prove necessary. The new Phase I rules, called “All Appropriate Inquiry” or AAI, also require more investigation than previously mandated. Investors can expect to see dramatic price increases over prior experiences.

2.4 **Phase II Environmental Site Assessment** – Investigation of real property through physical samplings and analyses to determine the nature and extent of contamination and, if indicated, a description of the recommended remediation method.

3.0 References

3.1 RS2-001-PR1 Firearms Standard

3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation

3.3 S3AM-008-PR1 Fitness for Duty

3.4 S3AM-113-PR1 Heat Stress

3.5 S3AM-208-PR1 Personal Protective Equipment

3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Managers / Supervisors

- Responsible for managing field work.

- Work with employees to see that a Task Hazard Analysis (THA) for the work to be conducted has been performed prior to the beginning of the field work and that it includes an assessment of potential biological hazards.
- Implement control measures at the location to reduce the potential for employees to be exposed to injuries and illnesses from biological hazards while working.
- If the exposures cannot be eliminated or managed with engineering controls, approve the use and cost of Personal Protective Equipment (PPE) and protective repellents and lotions and confirm that exposed employees have and use these products.

4.1.2 **SH&E Manager**

- Confirm training and guidance is provided to employees consistent with this procedure.
- During the performance of site visits, assess the precautions being taken against biological hazards for compliance with this procedure.
- Assist AECOM personnel in identifying hazards and selecting appropriate control measures.
- As applicable, review and approve relevant SH&E Plans for locations that have biological hazards.

4.1.3 **Employees**

- Participate in required training related this procedure.
- Participate in the development of THAs for the task, identify control measures to limit exposure and request PPE, repellents, and protective lotions identified by this procedure.
- Update the applicable THA when a new, unaccounted for biological hazard is identified. Employee shall stop work to identify appropriate elimination or control measures (and obtain any necessary guidance) before continuing work.
- Obtain approval from Managers and/or Supervisors to purchase selected PPE prior to purchasing.
- Implement the precautions appropriate to prevent exposure to the hazardous wildlife, insects and plants.
- Observe requirements for reporting (e.g. tick bites, skin irritations, etc.) as detailed within the procedure and attachments.

4.2 Training

4.2.1 Employees shall be trained to recognize organisms that represent a threat in the regions in which they work – experienced field staff shall provide on the job training to assist staff with hazard recognition.

4.2.2 Employees shall be properly trained to the anticipated tasks and the associated required PPE.

4.3 Overview

4.3.1 The procedures discussed below are detailed because these hazards have historically posed the most significant risk to AECOM employees. Note that this discussion is not a fully encompassing list of hazards. As part of the SH&E Plan and THA developed by the AECOM personnel, in accordance with *S3AM-209-PR1 Risk Assessment & Management*, additional consideration shall be given to other biological hazards.

4.3.2 Departments of Public Health local to the worksite, as well as the Centers for Disease Control (CDC) can serve as a resource for identifying biological hazards not discussed in this procedure.

4.3.3 If additional biological hazards are identified, employees should stop work and contact the SH&E Manager to discuss the hazards and identify effective control measures. Those control measures shall be implemented at the location prior to restarting work.

4.4 Employee Sensitivity

4.4.1 Sensitivity to toxins generated by plants, insects and animals varies according to dosage and the ability of the victim to process the toxin; therefore, it is difficult to predict whether a reaction will occur, or how severe the reaction will be. Employees should be aware that there are a large number of organisms capable of causing serious irritations and allergic reactions. Some reactions will only erupt if a secondary exposure to sunlight occurs. Depending on the severity of the reaction, the result can be severe scarring, blindness or even death.

4.4.2 Employees also need to consider whether they are sensitive to the use of insect repellents.

4.5 Planning and Hazard Assessment

4.5.1 AECOM personnel shall confirm that the potential for exposure to specific biological hazards are assessed prior to the commencement of work and that the procedures specified by this procedure are integrated into the THA planning process and conveyed to employees conducting the field work. This information shall be communicated in the location-specific SH&E plan, the THA, pre-project kickoff meetings, and tailgate meetings at the location.

4.5.2 It is important to note that the precautions to be taken by employees to decrease the risk of exposure to biological hazards can directly increase the risk of heat-related illness due to thermal stresses. Therefore, heat stress monitoring and precautions shall be included as a critical component of the task-specific THA in accordance with *S3AM-511-PR1 Heat Stress.*

4.5.3 During the preparation of the location-specific SH&E plan and task specific THA, Managers, Supervisors, and employees shall determine what biological hazards might be encountered during the task or operations and shall prescribe the precautions to be taken to reduce the potential for exposure and the severity of resulting illnesses. Consideration will be given to conditions such as weather, proximity to breeding areas, host animals, and published information discussing the presence of the hazards.

4.5.4 It should be assumed that at least one of the biological hazards exists whenever working on undeveloped property. This can include insect activity any time that local temperatures exceed 40 degrees Fahrenheit (4.5 degrees Celsius) for a period of more than 24 hours. The stubble and roots of poisonous plants can be a hazard any time of year, including when some plants are dormant or mown.

4.5.5 The hazard assessments shall also consider the additional hazards posed by vegetative clearing such as the increased risk of coming in contact with poison ivy, oak or sumac and hazards associated with the use of tools and equipment to remove vegetation.

4.5.6 Employees in the field where biological hazards exist shall not enter the hazard areas unless they are wearing the appropriate protective clothing, repellents, and barrier creams specified below. If the hazard is recognized in the field but was not adequately assessed during the THA, the field staff shall stop work and not proceed until the THA has been amended and approved and protective measures implemented.

4.5.7 Employees who have severe allergic reactions are strongly recommended to notify their Manager, field Supervisor and co-workers of the potential for a reaction and demonstrate what medication they might need, where they keep it and how it is administered.

4.5.8 A decision flow chart and table for determining the potential for biological hazards in the Americas has been provided in *S3AM-313-ATT1 Biological Hazard Assessment Flow Chart.*

4.5.9 Restrictions:

- No firearms or weapons are allowed to be used without express permission by the Region Executive and Chief Resilience Officer, refer to the *RS2-001-PR1 Firearms Standard*.
- No weapons related work shall occur without an assessment that includes appropriate hazard control measures and training.

- Staff with life-threatening reactions shall not undertake work in areas infested with the allergen (e.g., wasps, poison ivy), unless precautions are met which satisfy a medical practitioner's requirements. Refer to *S3AM-008-PR1 Fitness for Duty*.

4.5.10 Precautions

- Be aware of the potential irritants in your area and know how to recognize them.
- Modify activities to avoid encounters (diurnal rhythms, seasonal rhythms).
- Avoid wearing perfume and cologne and strong smelling deodorants, lotions, soaps, and shampoos.
- When working in areas where there may be small insects that "hitchhike" (e.g., ticks, spiders, scorpions), it is recommended that clothes are turned inside out and shaken at the end of day; do not wear same clothes two days in a row.
- Staff should always be aware of where they are placing their hands, or where they are sitting in order to avoid contact with potential toxins. Avoid reaching into areas where visibility is limited.

4.6 Wildlife Hazards (Wild Animals, Reptiles and Birds)

4.6.1 Employees shall not work alone in areas where the risk of an encounter with dangerous wildlife is high. Wildlife handling shall only be completed under direct supervision of an experienced individual. Refer to the following work instructions for more specifics:

- *S3AM-313-ATT13 Alligators*
- *S3AM-313-ATT9 Large Carnivores & Ungulates*
- *S3AM-313-ATT10 Bear Safety*
- *S3AM-313-ATT11 Small Mammals*
- *S3AM-313-ATT12 Snakes & Scorpions*

4.7 Ticks, Spiders and other Insects

4.7.1 Insects for which precautionary measures should be taken include but are not limited to: mosquitoes (potential carriers of disease aside from dermatitis), black flies, wasps, bees, ticks, fire ants and European fire ants.

4.7.2 Employees with known allergies to insect stings should consult their personal physician for advice on any immediate medications that they should carry with them. Epi-pens[1] shall be carried at all times in the field by employees who are aware that anaphylactic shock is a possibility for them AECOM highly recommends that employees with known allergies inform their co-workers of the allergy and the location of the medications they might carry for the allergy.

4.7.3 Habitat Avoidance, Elimination and/or Control

- The most effective method to manage worker safety and health is to eliminate, avoid and/or control hazards. Clearing the location of brush, high grass and foliage reduces the potential for exposure to biological hazards. Clearing will not eliminate the exposure to flying insects and there might be an increased exposure to ticks and spiders during the clearing process.
- Projects such as subsurface environmental assessment or remediation are often candidates for brush and overgrown grass to be cleared. In these instances, the Manager shall either request that the client eliminate vegetation, or request approval from the client to have vegetation clearing added to the scope of work.
    - o It should be noted that vegetation clearance may unintentionally serve to spread noxious and poisonous plant materials around the site.

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[1] *Epi-pens must be prescribed by a personal physician. Renew epi-pens on a regular schedule to ensure effectiveness and make sure your field companions know where it is and how to use it if you cannot self-administer the dose.*

  - o As applicable, measures should be taken to prevent spread, such as but not limited to, confirming equipment and materials are not placed on affected areas, and equipment is decontaminated after use and before removal from site.
- When work shall be conducted in areas that cannot or may not be cleared of foliage, personal precautions and protective measures shall be prescribed.
- Mosquitoes breed in stagnant water and typically only travel a quarter mile (less than half a kilometer) from their breeding site. Whenever possible, stagnant water should be drained to eliminate breeding areas. Managers and client site managers should be contacted to determine whether water can be drained and the most appropriate method for draining containers, containment areas, and other objects of standing water.
- If water cannot be drained, products similar to Mosquito Dunks® can be placed in the water to control mosquitoes. Once wet, the Mosquito Dunks® kill the immature, aquatic stage of the mosquito. The active ingredient is a beneficial organism that is lethal to mosquito larvae, but harmless to fish, humans, and other animals. Mosquito Dunks® provide long-term protection for 30 days or more.

4.7.4 Ticks

- Ticks can be encountered when walking in tall grass or shrubs. They crawl up clothing searching for exposed skin where they will attach themselves. The most serious concern is a possibility of contracting a disease.
- Data from the CDC indicates that tick-borne diseases have become increasingly prevalent. At the same time, tick repellents have become both safe and effective so it is possible to prevent the vast majority of bites and, therefore, most related illnesses. The use of permethrin is strongly advised.
- The most common and severe tick-borne illnesses in the U.S. are Lyme disease, Ehrlichiosis, and Rocky Mountain spotted fever. A summary table listing CDC informational resources for these diseases is provided in *S3AM-313-ATT2 Ticks* along with a listing of CDC information resources and maps showing the distribution of common tick-borne diseases in the U.S.
- When working in areas where ticks may occur, it is recommended that clothes are turned inside out and shaken at the end of day; do not wear the same clothes two days in a row.
- Employees should conduct a thorough full body tick check upon exiting the field. Shower within two hours of coming indoors to help wash away loose ticks. Clothes should be laundered in hot water or tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks.
- To remove ticks that are embedded in skin, utilize a tick key. Alternatively use tweezers or fingers to carefully grasp the tick as close to the skin as possible and pull slowly upward, avoiding twisting or crushing the tick. Do not try to burn or smother the tick. Cleanse the bite area with soap and water, alcohol, or household antiseptic. Note the date and location of the bite and save the tick in a secure container such as an empty pill vial or film canister. A bit of moistened paper towel placed inside the container will keep ticks from drying out. Follow AECOM incident reporting guidelines to report the tick bite within 4 hours and notify the Manager or Supervisor.
- Familiarize yourself with the characteristic bulls-eye pattern of Lyme disease infection surrounding the bite. If you notice this type of pattern or rash resulting from a tick bite, immediately report the issue to your supervisor and follow the incident reporting requirements for your business group.
- If you experience symptoms such as fever, headache, fatigue, and a skin rash, you should immediately visit a medical practitioner as Lyme disease is treated easily with antibiotics in the early stages, but can spread to the heart, joints, and nervous system if left untreated.

4.7.5 Chiggers

- Chiggers are mite larvae, approximately ½ millimeter in size, and typically invisible to the naked eye. While chiggers are not known to carry infectious diseases, their bites and resulting rashes and itching can lead to dermatitis and a secondary infection.
- Chiggers are typically active from the last hard freeze in the winter or spring to the first hard freeze. They are active all year in the Gulf Coast and tropical areas.

4.7.6 Spiders

- Spiders can be found in derelict buildings, sheltered areas, basements, storage areas, well heads and even on open ground. Spiders can be found year round in sheltered areas and are often present in well heads and valve boxes.
- Most spider bites produce wounds with localized inflammation and swelling. The Black Widow and Brown Recluse spiders in the U.S. and others outside the U.S. inject a toxin that causes extensive tissue damage and intense pain.
- Additional information on spider identification can be found in attachment *S3AM-313-ATT3 Poisonous Spider Identification*.

4.7.7 Mosquitoes

- When a mosquito bites, it injects an enzyme that breaks down blood capillaries and acts as an anticoagulant. The enzymes induce an immune response in the host that results in itching and local inflammation. The tendency to scratch the bite sites can lead to secondary infections.
- CDC data indicates that mosquito-borne illnesses, including the strains of encephalitis, are a health risk. At least one of the Encephalitis strains listed below is known to exist in every area of the U.S. and in many other countries as well:
    - Eastern Equine encephalitis
    - Western Equine encephalitis
    - West Nile Virus
    - St. Louis encephalitis
    - La Crosse encephalitis
- Mosquitoes can transmit the West Nile Virus and other forms of encephalitis after becoming infected by feeding on the blood of birds which carry the virus.
- Most people infected with the virus experience no symptoms or they have flu-like symptoms. Sometimes though, the virus can cause severe illness, resulting in hospitalization and even death, so proper precautions should be taken. Consult a medical practitioner if you suspect you have West Nile Virus. Other diseases including Dengue Fever and Malaria are spread by mosquitoes in the sub-tropic and tropical parts of the world. See *S3AM-313-ATT4 Mosquito Borne Diseases* for information on the locations where mosquito borne diseases are known to be present.

4.7.8 Bees, Wasps and Hornets

- Wasps and bees will cause a painful sting to anyone if they are harassed. They are of most concern for individuals with allergic reactions who can go into anaphylactic shock. Also, instances where an individual is exposed to multiple stings can cause a serious health concern for anyone. These insects are most likely to sting when their hive or nest is threatened.
- Bees, hornets, and wasps may be found in derelict buildings, sheltered areas, behind covers or lids and even on open ground. Other protective measures are not normally effective against aggressive, flying insects. Be aware of the potential areas for these types of insects, approach these locations cautiously. Avoid reaching into areas where visibility is limited.
- If you see a nest in the area you are working in stop work. Contact the Manager or Site Supervisor for procedures to have the nest removed.

- If stung by a wasp, bee or hornet, notify a co-worker or someone who can help should you have an allergic reaction. Stay calm and treat the area with ice or cold water. Follow AECOM incident reporting guidelines to report the sting within 4 hours and notify the Manager or Supervisor immediately. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite or sting, or any swelling or numbness beyond the site of the bite or sting.

4.7.9 Fire Ants

- The fire ant (southern and western U.S.) and the European fire ant (northeastern U.S. and eastern Canada) is often very abundant where it is established. It is very aggressive and commonly climbs up clothing and stings unprovoked when it comes into contact with skin. Painful irritations will persist for an hour or more.

4.7.10 Personal Protective Equipment (PPE)

- Chemically-treated field clothing, full-length clothing, or Tyvek® coveralls.
- Gloves shall also be worn consistent with the recommendations of the site-specific SWP and/or THA to minimize hand exposure.
- Where ticks, chiggers, and spiders are presumed to exist, the Tyvek® or chemically treated clothing will be taped to the work boots.
- See *S3AM-313-ATT2 Ticks* for configuration of clothing for protection against ticks and insects.
- Application of insect repellent to clothing and/or exposed skin. Oil of lemon eucalyptus, DEET, and Permethrin have been recommended by the CDC for effective protection against mosquitoes that may carry the West Nile virus and related diseases.
- Note that DEET will reduce the effectiveness of Fire Resistance Clothing (FRC) and should not be applied to this clothing. If working in FRC, employees can use Permethrin as it has been shown not to reduce the effectiveness of FRC. Permethrin will need to be applied to FRC well in advance of the planned work. If permethrin is unavailable employees can apply DEET to their skin and let dry prior to putting FRC on.
    - Oil of Lemon Eucalyptus is a plant-based insect repellent on the market as Repel Lemon Eucalyptus. The products have been proven to be effective against mosquitoes, deer ticks, and no-see-ums for up to six hours. Derived from Oil of Lemon Eucalyptus, this non-greasy lotion or spray has a pleasant scent and is not known to be toxic to humans. The spray or lotions will be effective for approximately two to six hours and should be reapplied every two hours to sustain protection. Lemon Eucalyptus products cannot be applied to fire retardant clothing.
    - Permethrin is an insecticide with repellent properties registered with the Environmental Protection Agency and recommended by the CDC.
        - Permethrin is highly effective in preventing tick bites when applied to clothing, but is not effective when applied directly to the skin. Two options are available for Permethrin treatment of clothing worn during field work: 1) pre-treatment of fabric by the clothing manufacturer; or 2) manual treatment of their personal clothing using Permethrin spray in accordance with recommendations manufacturers recommendations. This will likely require treatment at home or the office prior to field mobilization. Caution should be used when applying Permethrin as it is highly toxic to fish and house cats. AECOM strongly recommends the first option (employees obtaining pre-treated clothing) to avoid the time required, potential risk, and housekeeping issues involved with manually treating the clothing with spray. Purchase pre-treated clothing in accordance with *S3AM-208-PR1 Personal Protective Equipment* and with the approval of your Supervisor or Manager.
        - The Permethrin pre-treatment is odorless and retains its effectiveness for approximately 25 washings. After 25 washings, the pre-treated clothing will be

considered no longer effective and removed from service. Clothing that has been manually treated by employees will be considered effective for five wash cycles.

- Also, use of clothing that has been pre-treated with Permethrin offers a reduction in the use and application of other insect repellents that shall be applied directly to the skin. Supervisor or Manager approval is required prior to purchase.
- If the employee opts not to utilize chemically pre-treated clothing while potentially exposed to insects, spiders and/or ticks, they shall either: 1) wear Tyvek® coveralls taped to the boots, or 2) wear full-length clothing consisting of long-legged pants and long-sleeved shirts treated with an insect repellent containing Permethrin, DEET, or an oil of lemon eucalyptus to their work clothing.
- Safety Data Sheets (SDS) for the repellents, lotions, and cleansers discussed in this Procedure are not required because the repellents, lotion, and clothing are consumer products used in the manner intended for the general public. Although not required, a SDS should be obtained for the products used and placed into the office SDS library and site-specific safety plan.

4.8 Poisonous Plants

4.8.1 Habitat Avoidance, Elimination and/or Control

- If poisonous plants are identified in the work area, employees will mark the plants using either flags or marking paint, and discuss what the specific indicator will be to signal to other employees to avoid the designated area. If employees decide to use ground-marking paint to identify poisonous plants, they should discuss this tactic with the Manager (and Client as appropriate) for approval.
- If removal of the plants is considered, it should be subcontracted to a professional landscaping service that is capable and experienced in removing the plant. If herbicides are considered for use, a discussion shall need to occur with the Manager (and Client as appropriate) to determine whether it is acceptable to apply herbicides at the work site. Application of herbicides may require a license.
- Employees shall not attempt to physically remove poisonous plants from the work area unless a clearing procedure, including PPE, is prepared in advance and approved by the SH&E Manager. The clearing procedure should be included in the SH&E Plan and THA and the required PPE specified.

4.8.2 Poisonous plants that employees should recognize and take precautions to avoid include: poison sumac, poison ivy (terrestrial and climbing), poison oak, giant hogweed[2] (or giant cow parsnip), wild parsnip, devil's club and stinging nettle. Many others are extremely poisonous to eat (e.g., poison hemlock; water parsnip) – do not eat anything that has not been identified. Refer to *S3AM-313-ATT5 Plants of Concern* for information on locations where some of these poisonous plants are found in the U.S.

- Of the toxic plants in the cashew family, poison ivy (*Rhus radicans*) is most widespread. It grows in a variety of forms such as a low sprawling shrub, dense ground cover, or a thick woody vine that grows high into the tree canopy. Poison oak (*Rhus diversiloba*) is typically a low shrub in drier soils. Both of these plants have leaves of three and white berries. Poison sumac (*Rhus vernix*) is a tall shrub that is less prolific in distribution. It grows in wet areas, has a compound leaf with a red leaf stem (rachis), and white berries. All of these plants possess urushiol oils in all parts of the plant. Touching the plant causes an itchy skin rash that can show up within 4-72 hours following contact. People have a wide range of reactions including swelling, itching, rash and bumps, patches or blisters.
- Uroshiol oil can also transfer onto clothing and equipment. The oil can remain active on surfaces for up to 5 years and can be transferred to your skin.

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[2] Phytodermatisi producer: keep skin covered and wash well after exposure

- Wild parsnip is found throughout the U.S. and contains a poison that produces a rash similar to poison oak and ivy. Unlike poison oak and ivy, the active oil will not be present on unbroken leaves. See *S3AM-313-ATT6 Wild Parsnip Identification* for additional information and photos of wild parsnip.
- Several plants in the carrot family contain toxic sap that causes severe dermatitis if it comes into contact with skin that is then exposed to sunlight. The most serious reaction is caused by the giant hogweed (*Heracleum mantegazzianum*), a plant that is spreading in southern Ontario and is also present in southwestern British Columbia. The plant is enormous, attaining up to 16 feet (5 meters) in height, which it does in one growing season. Contact causes painful blistering that can cause permanent disfigurement. It is to be avoided. Similar but less serious reactions can be caused by meadow parsnip (*Pastinaca sativa*) and cow parsnip (*Heracleum lanatum*). Meadow parsnip can be very abundant on disturbed sites.
- Nettles, particularly stinging nettle (*Urtica dioica*) and wood nettle (*Laportea canadensis*) contain urticating hairs on the leaves and stems that cause sharp pain or itchiness on contact with skin. The irritation is immediate and normally lasts no more than an hour and there are no lasting consequences.
- Some plants contain abundant stiff spines that can present a safety hazard, particularly if one is to fall into them. These include the cactus (*Opuntia spp.*), devils club (*Oplopanax horridum*), and prickly-ash (*Zanthoxylon americanum*).

4.8.3 A large number of plants are not harmful to touch but may contain poisonous berries or foliage that could cause serious complications or death if they are ingested. It goes without saying to not eat any berries or plants if you are unsure of their identity.

- Remember that in the fall and winter the hazard still exists in the form of stubble and roots.

4.8.4 Personal Protective Equipment (PPE)

- Employees conducting clearing, grubbing, or similarly disturbing work activities in areas where poisonous plants exist shall wear long-sleeve clothing or Tyvek® coveralls, and disposable cotton, leather or synthetic gloves. Employees shall not touch exposed skin (neck and face) with potentially contaminated gloves. Tyvek® and gloves worn to protect from exposure to poisonous plants shall be treated as contaminated, removed from the body in a manner that the contamination is not spread, and placed in plastic bags for disposal.
- Personal clothing that has been exposed to poisonous plants shall be decontaminated with a poisonous plant cleanser such as Tecnu® or removed in a careful manner, bagged and washed separately from other clothing to remove urushiol.
- Work boots will be decontaminated with either soap and water or a cleansing agent such as Tecnu® cleanser.
- If foliage is being cleared and includes poisonous plants, exposed skin shall be treated with a dermal barrier cream such as Tecnu®'s Oak 'n Ivy Armor or Enviroderm's Ivy Block and either a full-face respirator or a half-face respirator (with goggles) fitted with a P-100 (HEPA) dust filter.

4.9 Bird Droppings and Biological Soil Hazards

4.9.1 Work in any area where pigeons or other flying animals (e.g. bats) may nest requires a written statement from the client which states the potential for, and extent of, accumulation of excrement on/in the structure from pigeons or other winged animals.

4.9.2 Substantial accumulations of droppings can pose physical and health risks as slippery surfaces (if wet) and if the material is disturbed and becomes airborne, it can be inhaled or ingested if personal hygiene practices are not implemented. Inhalation of airborne droppings can cause diseases such as histoplasmosis. Exposure to surfaces with bird droppings shall be safeguarded by implementing proper work practices, training employees for awareness and using PPE. See *S3AM-313-ATT8 Bird Droppings*.

4.9.3 Tularemia is a problem with contaminated soil in some locations. Tularemia is a disease of animals and humans caused by the bacterium *Francisella tularensis*. Rabbits, hares, and rodents are especially susceptible and often die in large numbers during outbreaks. Workers can contract Tularemia through tick and deer fly bites, but also through inhalation of contaminated aerosols or agricultural dusts. Check work areas for carcasses before disturbing the ground (e.g. mowing, brushing, grubbing, excavation, etc.).

4.10 Personal Hygiene and Body Checks

4.10.1 Tick-borne diseases typically require that the tick be imbedded for four hours to begin disease transfer. The oils from poisonous plants can take up to 4 hours after exposure to penetrate the skin and react with the live proteins under the skin.

4.10.2 It is recommended that exposed skin be checked frequently for the presence of ticks, insects, rashes, or discolorations. External clothing should also be checked for the presence of ticks and insects; these should be retained for identification and to determine if medical treatment is needed.

4.10.3 Employees shall shower as soon as practical after working in the field and examine their bodies for the presence of ticks, insect bites, rashes, or swollen areas. If imbedded ticks are found, they should be removed using the technique described in *S3AM-313-ATT2 Ticks*.

4.11 Employees shall immediately notify their Manager or Supervisor of the presence of an imbedded tick, bee, wasp or hornet sting, other insect bite, rash, or any abnormal reaction. Reporting shall occur within 4 hours for a significant incident and 24 hours for all other SH&E incidents, and in accordance with *S3AM-004-PR Incident Reporting, Notifications & Investigation.*

4.12 The Manager or Supervisor shall forward the report to the SH&E Manager for follow up.

5.0 Records

None

6.0 Attachments

6.1 S3AM-313-ATT1 Biological Hazard Assessment Flow Chart

6.2 S3AM-313-ATT2 Ticks

6.3 S3AM-313-ATT3 Poisonous Spider Identification

6.4 S3AM-313-ATT4 Mosquito Borne Diseases

6.5 S3AM-313-ATT5 Plants of Concern

6.6 S3AM-313-ATT6 Wild Parsnip Identification

6.7 S3AM-313-ATT7 Alligators

6.8 S3AM-313-ATT8 Bird Droppings

6.9 S3AM-313-ATT9 Large Carnivores & Ungulates

6.10 S3AM-313-ATT10 Bear Safety

6.11 S3AM-313-ATT11 Small Mammals

6.12 S3AM-313-ATT12 Snakes & Scorpions

Drilling, Boring & Direct Push Probing

S3AM-321-PR1

1.0 Purpose and Scope

1.1 This document provides procedures designed to help prevent injuries to personnel working on the project and pedestrians, property damage, and adverse environmental impact as a result of potential hazards associated with drilling, boring and direct-push probing. These hazards include, but are not limited to, encountering underground utilities, subsurface installations, rotating equipment and potential overhead hazards.

1.2 This procedure provides the minimum requirements to be followed when drilling, boring, and probing work are performed.

1.3 This procedure applies to all Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

1.4 The Manager is responsible for meeting all the requirements in this procedure.

1.5 AECOM's clients may have specific procedures which shall be followed to identify and map utility and subsurface structures on their properties or facilities. Provided the client's procedures meet or exceed those of AECOM, approval shall be obtained from the Manager and the SH&E Manager to follow the client's procedures.

2.0 Terms and Definitions

2.1 **Underground Utilities –** All utility systems located beneath grade level, including, but not limited to, gas, electrical, water, compressed air, sewage, signaling, and communications, etc.

2.2 **Ground Disturbance (GD) –** Any indentation, interruption, intrusion, excavation, construction, or other activity in the earth's surface as a result of work that results in the penetration of the ground.

2.3 **Intrusive Activities –** Examples: Excavation of soil borings, installations of monitoring wells, installation of soil gas sampling probes, excavation of test pits / trenches or other man-made cuts, cavity, trench, or depression in an earth surface formed by earth removal.

2.4 **Subsurface Installations –** Examples: Subterranean tunnels, underground parking garages, and other structures beneath the surface.

3.0 References

3.1	S3AM-003-PR1	SH&E Training
3.2	S3AM-118-PR1	Hearing Conservation
3.3	S3AM-208-PR1	Personal Protection Equipment
3.4	S3AM-209-PR1	Risk Assessment & Management
3.5	S3AM-213-PR1	Subcontractor Management
3.6	S3AM-305-PR1	Hand & Power Tools
3.7	S3AM-306-PR1	Highway and Road Work
3.8	S3AM-322-PR1	Overhead Lines
3.9	S3AM-322-FM1	Overhead Electrical Lines Acknowledgement
3.10	S3AM-325-PR1	Lockout Tagout
3.11	S3AM-326-PR1	Machine Guarding
3.12	S3AM-331-PR1	Underground Utilities

3.13 S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

- Confirm the development of the project SH&E Plan and compliance with this procedure.
- Confirm the appropriate equipment and materials are available to conduct the drilling, boring or direct-push operations.
- Confirm compliance with *S3AM-331-PR1 Underground Utilities.*
- Review the *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* prior to authorizing work to proceed.
- Confirm that employees conducting drilling, boring or direct-push probing possess any required training, registrations or certifications.
- Confirm all employees involved and affected by the task review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Provide authorization (with the concurrence of the Site Supervisor and SH&E Manager) for work to resume if interrupted due to unexpected conditions or events.

4.1.2 **Safety, Health & Environment (SH&E) Manager**

- Assist AECOM management as needed by providing guidance and clarification as to issues that may arise.
- Review the project SH&E Plan to confirm compliance with jurisdictional regulations**.** Provide technical guidance as needed when a variance is pursued related to this procedure. Confirm variance process meets requirements identified in *S2-001-SM1 Global SH&E Management System Manual*.

4.1.3 **Employees**

- Maintain training as appropriate to the work to be completed (e.g., ground disturbance, lockout tagout, equipment operation, etc.). Refer to *S3AM-003-PR1 SH&E Training.*
- Review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- As appropriate to the anticipated or encountered hazards and as addressed in the applicable planning documentation, utilize appropriate personal protective equipment (PPE) and applicable training, practices and operating procedures.
- Immediately notify the Manager of any unanticipated conditions or events. If assigned equipment, perform appropriate inspections and confirmations of maintenance and / or repairs.

4.2 Training

4.2.1 All on-site employees involved with drilling, boring, and direct-push probing shall be trained, at a minimum, in these procedures and in the procedures of *S3AM-331-PR1 Underground Utilities*.

4.2.2 All operators and assistants shall have the appropriate safety training based on the SH&E Training Matrix and any additional training assessments developed at the business group**,** and be versed in the equipment to be utilized.

- Refer to *S3AM-003-PR1 SH&E Training.*

- This training may include, but is not limited to, Excavation / Trenching (Ground Disturbance), HAZWOPER, Petroleum Safety Training (or Construction Safety Training), and H2S Alive as appropriate.
- Only qualified personnel shall operate and inspect equipment.

4.2.3 All on-site Employees involved with drilling, boring, and direct-push probing activities shall be provided with on-site orientation of the drill rig and its operation.

4.2.4 All Employees involved with drilling, boring and direct-push probing activities at a client site shall receive the applicable client-required training**.**

4.3 Planning

4.3.1 SH&E Plan – At a minimum, a SH&E plan that includes a pre-job hazard assessment shall be prepared and communicated to all involved personnel prior to any drilling, boring, and direct-push probing activities. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

- Assessment shall include both overhead and subsurface utilities and installations. Refer to *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities*.
- The SH&E Plan will address any required environmental monitoring including gas monitoring, dust, noise, metals, radiation or other monitoring as may be appropriate for site conditions.
- All SH&E Plan requirements will be followed by the project team.
- The location specific emergency response plan shall be in place, contain procedures applicable to the potential emergencies presented by the operations, and be reviewed with all personnel potentially affected.

4.3.2 A Task Hazard Assessment (THA) shall be completed before every assigned task at the work location. The focus of the analysis shall be on the specific assigned task and the evaluation of risks and assignment of control measures based on actual work conditions.

4.3.3 *S3AM-321- ATT2 Pre-Drilling, Boring & Direct-Push Probing Flow Chart* summarizes the key Pre-Drilling, Boring, and Direct-push probing requirements addressed in this procedure.

4.3.4 Procedures and documentation as detailed in *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities* shall be completed prior to any intrusive subsurface work.

- The locations of subsurface and overhead utilities and subsurface installations will be investigated, documented, mapped on a site plan and evidenced with appropriate surface markings.
- A site walk shall be conducted by the project team / site Manager and any other appropriate personnel, with the objectives of reviewing all planned intrusive activity locations, the locations of subsurface and overhead utilities and the potential for subsurface installations, to determine the appropriate utility clearance activities, and to observe other physical hazards.
- All proposed subsurface activities will be reviewed in comparison to subsurface and overhead utilities and subsurface installations and adjustments made as necessary.
- Appropriate clearance activities shall confirm location(s) of identified underground utilities and subsurface structures. Review the applicable completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist.*
- Site Walks should be repeated as necessary following the clearance of subsurface utilities and installations to confirm hazards are clearly identified.

4.3.5 Confirm drilling location(s) and / or bore entry and bore exit points are adequately identified on the worksite to enable appropriate equipment positioning.

4.4 Permits, Notifications and Access Agreements

4.4.1 Any required notifications shall be provided within the appropriate timeframe to the applicable organization (e.g. owner, agency, governing body, etc.).

4.4.2 All applicable permits (e.g. client, government, working near rail road, etc.) will be identified, obtained, and adhered to.

4.4.3 Access agreements will be obtained and adhered to as necessary.

4.5 Pre-Qualifying and Re-Qualifying Drilling Subcontractors

4.5.1 All drilling subcontractors will be properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management*.

4.5.2 The qualifications of the drilling crew performing the work will be evaluated prior to each mobilization and each day by AECOM's on-site representative to assure that their safety performance, training, qualifications, equipment, processes, and approaches reflect AECOM standards for excellence.

4.5.3 All drilling subcontractor equipment will be properly maintained and properly equipped, and the drilling subcontractor will verify their equipment is fully functional as a normal part of their daily and pre-work routine. Refer to *S3AM-321-FM1 Daily Drilling, Boring & Direct Push Equipment Inspection.*

4.6 General Health and Safety

4.6.1 Personal Protective Equipment – Refer to the *S3AM-208-PR1 Personal Protection Equipment* for best practices. These requirements may be modified or expanded in the SH&E Plan. Clothing shall be close fitting and comfortable without loose ends, straps, draw strings, belts, or otherwise unfastened parts that might catch on some rotating or translating component of the rig.

- Depending upon the hazards present, additional PPE may be required such as fire retardant clothing, specific hearing protection, respiratory protective equipment and chemical protective clothing.
- If the location has potential for underground electrical utilities to be present, workers shall ensure footwear has additional protection of shock resistant soles required (white rectangle with omega symbol).

4.6.2 Hearing Conservation – Hearing conservation program requirements may apply when working around operating equipment. Refer to *S3AM-118-PR1 Hearing Conservation*.

- Each worker shall wear noise-reducing ear protectors around operating equipment or during elevated noise levels. Distance from the elevated noise level is the primary measure of control for non-essential drilling personnel.

4.7 Drilling, Boring and Direct Push Equipment Maintenance and Inspections

4.7.1 All equipment will be inspected prior to the initiation of operations and daily during operations using the *S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection*. This inspection is the responsibility of the operator who will provide written documentation of the inspection prior to the start of drilling each day.

- Equipment that is deemed defective will immediately be repaired by a qualified person, or, if repair is not practicable, tagged "Out of Service" and sent for repairs or discarded.

4.7.2 Managers shall confirm an accurate inventory of the equipment within their operation requiring scheduled maintenance is developed. Using applicable regulations, industry standards, best practices, and manufacturer's recommendations, a maintenance schedule shall be developed with defined responsibility, required actions, and frequency. Refer to *S3AM-321-FM2 Drilling, Boring, & Direct-Push Equipment Maintenance Inventory.*

4.7.3 The maintenance program for equipment shall:

- Adhere to applicable regulations, standards, and manufacturers' specifications;
- Provide for service by appropriately qualified maintenance personnel; and,
- Require maintenance schedules and records of maintenance.

4.7.4 Employees or operators who are assigned equipment are required to review maintenance schedules for that equipment and will confirm that required maintenance has occurred or see that it is undertaken.

4.8 General Requirements

4.8.1 Excluding geoprobe activities, set up any sample tables and general work areas for employees at a safe distance from the rig.

- The recommended safe distance is the height of the fully extended mast plus 5 feet (1.5 meters), and no less than 30 feet (9.1 meters) from the rig.
- An increase to this distance may be required due to noise exposure hazards. Refer to *S3AM-118-PR1Hearing Conservation.*

4.8.2 Operation of the drilling, boring or direct-push equipment shall be restricted to the designated operator except to activate the emergency shut-off as required.

- All rotary drilling equipment shall have an emergency shut off / kill switch. The location of the switch and operation should be reviewed with all involved Employees.

4.8.3 Sit-on direct push rigs are not permitted on AECOM worksites unless the rig has been modified (in accordance with manufacturer's requirements) to be operated by remote control or the rig has been manufactured with a rollover protection system and seat belt.

4.8.4 Consult jurisdictional regulations as use of J-hooks and cat-heads may be prohibited. Examples:

- 29 CFR 1926 requires derricks and cranes to use hooks with self-closing latches and permits the use of J-hooks only for a task unrelated to this procedure (setting trusses).
- British Columbia and Saskatchewan prohibit the use of friction cat-heads.

4.9 Identifying the Work Area

4.9.1 Ensure the work area is adequately identified:

- Including zone around the drilling, boring, or direct push equipment, as well as fluid equipment, entry point, exit point and any excavated areas.
- Utilize barricades, signage, pylons, snow fence, etc. as appropriate.
- Implement traffic control as necessary.
- Coordinate with concurrent operations to identify their associated hazards and controls, and communicate those associated with AECOM tasks.

4.9.2 When operating near public vehicular and pedestrian traffic, the on-site personnel shall take every precaution necessary to see that the work zone is properly established, identified, and isolated from both moving traffic and passer-by pedestrians (refer to *S3AM-306-PR1 Highway and Road Work*).

4.9.3 All traffic control devices shall be installed, placed, and maintained in accordance with a Traffic Control Plan, client specifications, and / or the Manual of Uniform Traffic Control Devices and Manual of Uniform Traffic Control Devices for Canada in Canada. Traffic control devices shall consist of and not be limited to

- Directional and informational signage;
- High visibility barricades, cones, or barrels;
- Lighting; and
- Other equipment and devices as required.

4.10 Clearing Work Areas

4.10.1 In addition to any minimum requirements the drilling subcontractor may have, prior to set up, adequate site clearing and leveling shall be performed to accommodate the rig and supplies and provide a safe working area.

4.10.2 Clearing the site includes clearing the intended drilling area obstacles and of underground utilities in accordance with *S3AM-331-PR1 Underground Utilities*.

4.10.3 Drilling or probing shall not commence when tree limbs, unstable ground, or site obstructions cause unsafe tool handling conditions.

- The cleared / levelled area should be large enough to accommodate the rig and supplies.
- If the rig is positioned on a steep grade and levelling of the ground is impossible or impractical, the wheel of the transport vehicle shall be blocked and other means employed of preventing the rig from moving or toppling over.

4.11 Drilling Activities

4.11.1 Federal / State / Provincial / Territorial regulations that govern drill rig operations and exposed moving parts shall be adhered to.

4.11.2 All applicable client on-site safety procedures shall be understood and adhered to.

4.11.3 Minimum approach distances (MAD) from subsurface and overhead utilities and subsurface installations will be established including 5 feet (1.5 meters) from any subsurface utility, 7 feet (2.1 meters) from the pad surrounding any underground storage tanks, and 10 feet (3 meters) from any overhead energized electrical line (or further depending on line voltage). These approach distances are a minimum; government regulations and utility requirements may dictate a greater set back distance and should be confirmed.

4.11.4 Verify that equipment / energy is isolated when lockout is required:

- Refer to operator's manual and *S3AM-325-PR1 Lockout Tagout*.
- Ensure stop switch is activated.
- Driller is out of the seat.
- Test controls to ensure they do not engage.

4.11.5 In addition to any identified minimum requirements (as applicable, client, drilling subcontractor), the following safety measures shall be taken during drilling, boring or probing operations on site:

- The operator and helper shall be present during all active rig operations.
- Site personnel shall remain within visual contact of the rig operator.
- Hard hats, approved safety boots, safety glasses, and hearing protection shall be worn in the work zone (minimum, the radius around the rig equal to the height of the drill rig mast) of a rig.
- Gas monitoring shall be conducted as appropriate.
- Hands, feet and other body parts shall be kept away from moving parts, (e.g. hoisted, rotating, pushing, etc.) including augers, drill rods and reamers.
- When observing drilling, stand upwind of the drill rig to prevent potential exposure to vapors that may be emitted from the borehole.
- The emergency shut-off switch on the rig shall be identified to site personnel and tested on a daily basis by the operator.
- Unauthorized personnel shall be kept outside of the established work zone.
- Rig crew and other worksite personnel shall not use a cell phone while operating the drill rig or other equipment or within the rig work zone.
- Do not drive the rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick) look up to check for overhead obstructions. Refer to *S3AM-322-PR1 Overhead Lines*.

- Before raising the mast (derrick), all rig personnel (with the exception of the operator) and visitors should be cleared from the areas immediately to the rear and the sides of the mast. All rig personnel and visitors should be informed that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig shall be first levelled and stabilized with levelling jacks and / or solid cribbing.
  - The drill rig shall be releveled if it settles after initial set up.
  - Lower the mast (derrick) only when the levelling jacks are down, and do not raise the levelling jack pads until the mast (derrick) is lowered completely.
- After the rig has been positioned to begin drilling, all brakes and / or locks shall be set before drilling begins.
- The operator of a rig shall only operate a drill rig from the position of the controls. The rig shall not be in operation if the operator of the rig leaves the area of the controls.
- Throwing or dropping tools shall not be permitted. All tools shall be carefully passed by hand between personnel or a hoist line should be used.
- If it is necessary to operate the rig within an enclosed area, make certain that exhaust fumes are conducted out of the area.
  - Exhaust fumes can be toxic and some cannot be detected by smell.
  - Air monitoring and, as necessary, noise monitoring shall be conducted.
- Clean mud and grease from boots before mounting a rig platform and use hand holds and railings. Watch for slippery ground when dismounting from the platform.
- During freezing weather, do not touch any metal parts of the rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- All unattended bore holes shall be adequately covered or otherwise protected to prevent rig personnel, site visitors, or animals from stepping or falling into the hole. All open bore holes shall be covered, protected, or backfilled adequately and according to Federal / State / Provincial / Territorial or local regulations on completion of the drilling project.
- When using a ladder on a rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending and descending. Always use adequate fall protection and a full body harness when climbing above 6 feet (1.8 meters) of the ground. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool “bucket” or a safety hook to raise or lower hand tools.

4.12 Drilling Fluid

4.12.1 Ensure drilling fluid is appropriate to the soil type and conditions to be encountered to enable smooth drilling.

4.12.2 Drilling fluid used in the boring process shall be contained at the entry and, as applicable, exit locations until recycled or removed from the site.

4.12.3 Confirm drilling fluid does not enter roadways, streams, municipal storm or sanitary sewer lines, and / or any other drainage system or body of water.

4.12.4 Monitor drilling equipment and fluid equipment for any leakage or spills. Confirm appropriate containment is in place and adequate spill response supplies are available.

4.12.5 It is important to monitor fluid flow and pressure gauges when drilling with any tooling, but it is essential when drilling with a mud motor (pump placed in the drill string to provide additional power to the bit while drilling).

4.13 Unanticipated Concrete / Debris or Void

4.13.1 The presence of subsurface installations and utilities requires special care when obstructions / refusal and voids are encountered and when unexpected absence of soil recovery occurs during drilling operations. Other indicators of subsurface installations and utilities are the presence of warning tape, pea gravel, sand, non-indigenous material, bentonite, red concrete (indicative of electrical duct banks) and any departure from native soil or backfill.

4.13.2 If unanticipated concrete / debris is encountered and / or if a void is encountered, drilling will be immediately discontinued and the Manager notified. Drilling may only proceed with Manager or SH&E Manager approval.

4.14 Use of Manual Slide Hammer

4.14.1 The following health and safety procedures should be followed when using a manual slide hammer to install shallow injection points, drive point piezometers, and drill tools:

- Only use a manual slide hammer that either attaches directly to the point / piezometer being driven or that incorporates a cap on the point / piezometer / drill tool that prevents the slide hammer from slipping off the point / piezometer / drill tool.
- Always grasp the manual slide hammer (handles if equipped with handles) with both hands while driving the point / piezometer / drill tool.
- Never allow hands or feet to get between the manual slide hammer and the drive plate or anvil.

4.15 Use of Augers

4.15.1 The following general health and safety procedures should be followed when supervising borings with continuous flight hollow-stem augers:

- Never place hands or fingers under the bottom of an auger section when it is being hoisted over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When augers are rotating, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.
- Use a long-handled shovel to move auger cuttings away from a rotating auger. Never use hands or feet to move cuttings away from a rotating auger.
- Do not attempt to remove earth from rotating augers. Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.
- Loud noises may occur while driving split spoons. At minimum hearing protection shall be worn when driving split spoons.
- When pulling / lifting augers, a clevis pin or other closed device shall be used. Use of J-hooks is prohibited.

4.16 Attaching and Breaking Rods

4.16.1 Do not use manual tools (e.g., pipe wrenches) in combination with rotation of the drill stem. Manual tools are not designed for the load, and may break.

- The use of such tools creates a significant impact hazard for those in the work area, because they rotate with the drill stem. Manual tool use in combination with a rotating drill stem to attach or break rods is therefore prohibited.
- Manual tools may be used if the drill stem is isolated / positively disengaged.
- Mechanical means of rod separation that are permitted include:
  - Opposing hydraulic controls.
  - Rod locking devices or machine's power vice.
  - Hydraulic breakout tools.
  - Hydraulic foot clamps.

4.16.2 Rod box changes present severe crushing hazards. Operators shall ensure all crew members are clear of the machine and hoisting equipment while they are changing rod boxes.

4.17 Rotary, Sonic and Core Drilling

4.17.1 In addition to the health and safety procedures identified above, the following general health and safety procedures should be followed when supervising borings with rotary, sonic and core drilling:

- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws. Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
- When drill rods are rotating, stay clear of the rotating components of the drill rig. Never reach behind or around a rotating drill rod for any reason.
- Use a long-handled shovel to move cuttings away from the top of the borehole. Never use hands or feet to move cuttings away from the borehole.
- If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Keep away from area where drill rods are being moved or raised to the rig. Do not stand in the area where a drill rod will fall or slide if it should be dropped.
- Loud noises may occur during drilling. Hearing protection shall be worn.

4.18 Direct-push

4.18.1 The following general health and safety procedures should be followed when supervising drilling borings with direct-push drilling:

- Loud noise may occur during direct-push drilling. Appropriate hearing protection shall be worn.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
- If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

4.19 Horizontal Directional Drilling

4.19.1 During surface to surface operations a 16.4’ (5 meters) safe zone shall be established and identified at both the entry and exit locations; no personnel are permitted to be within this zone unless the drill is locked out and the operator is out of the seat.

4.19.2 Machine shall be locked out before entering an excavation, changing tools, adding or removing drill stem or doing any other work on tools or the drill stem at the exit end of the bore.

4.19.3 A tracking head shall be installed on the drill stem:

4.19.4 Assemble drill head using components appropriate to the soil conditions to be encountered (e.g. nozzle, bit, beacon housing, etc.).

4.19.5 Ensure all personnel are clear of the bore entry point (outside of identified work zone).

4.19.6 At all times two way communication will be maintained at entrance and exit points using two way radios or equally effective communication means. If at any time communication is lost, all work will be stopped until communication is re-established

4.19.7 Locate drill head with tracking device at least every half-length of pipe. Adjust direction as necessary to follow the intended bore path.

4.19.8 Any drilling fluid returning to the surface shall be cleaned up promptly.

4.19.9 Drill pipe should exit the bore at an angle of 5 to 10° from the ground surface.

4.19.10 Turn off fluid flow as soon as drill head emerges.

4.19.11 Lockout machine and remove drill head using appropriate breakout tools.

4.19.12 Select and attach a reamer that allows the return of drilling fluids and cuttings, to reduce frictional pullback forces, and to allow for bend radius of the pipe. Reamer shall be:

- The smaller of 1.5 times the outside diameter (O.D.) or 12 inches (300mm) larger than the diameter of the product pipe.
- A diameter less than 1.5 times the diameter of the product may be necessary in collapsing soil formations.
- Reamed diameter may need to be increased by up to 25% if substantial swelling of the soil is expected to occur.

4.19.13 All personnel shall clear the trench or the designated surface zone (16.4 feet [5 meters]) once the reamer is attached. Operator shall only reverse lockout and commence pullback when communication is received from personnel on exit hole side and operator has confirmed the message.

4.19.14 Personnel on exit hole side shall ensure reamer is pulled the entire way back to the exit hole.

- If rotation is started when drill rod and reamer are away from the exit hole, very fast sideways movement of the rod and reamer can occur.
- Larger reamers and longer lengths of exposed drill rod increase the speed and distance of this movement.

4.19.15 If working with trailing drill stem, swivels shall be verified as lubricated and rotating freely by hand prior to use:

- A freely moving swivel prevents trailing drill stem or product from rotating / whipping.
- If the swivel does not move freely by hand it shall be removed from service and repaired or replaced.
- Only use swivels with limited articulation to prevent whipping or cranking action between the reamer and trailing drill pipe or product.

4.19.16 It is important to clean and lubricate the tool and drill stem joint threads before each use.

4.19.17 Any individual drill pipes that are bent or damaged shall be immediately taken out of service.

4.19.18 Occasionally change the order of the lead drill pipe (i.e. move the lead pipe to the end of the stem, or other pipe rotation procedures) to extend drill stem life.

4.19.19 Operator should avoid stalling the pipe rotation to avoid stress damage from shock loading.

4.20 Drilling at Potential MEC / UXO Sites

4.20.1 If the project site is suspected of containing munitions and explosives of concern (MEC) or unexploded ordnance (UXO), the UXO team will conduct a reconnaissance and MEC / UXO avoidance to provide clear access routes to each site before drilling crews enter the area. The following procedures will be implemented:

- Drilling operations on an MEC / UXO site will not be conducted until a complete plan for the site is prepared and approved by the AECOM UXO Safety Officer. MEC / UXO avoidance shall be conducted during drilling operations on known or suspect MEC / UXO sites.
- The UXO team will identify and distinctly mark the boundaries of a clear approach path for the drilling crews, vehicles, and equipment to enter the site. This path will be, at a minimum, twice the width of the widest vehicle. No personnel will be allowed outside any marked boundary.
- If MEC / UXO is encountered on the ground surface, the UXO team will clearly mark the area where it is found, report it to the proper authorities, and divert the approach path around it.
- The UXO team will conduct an access survey using the appropriate geophysical instrument over the approach path for avoidance of MEC / UXO that may be in the subsurface. If a magnetic anomaly is encountered, it will be assumed to be MEC / UXO, and the approach path will be diverted around the anomaly. UXO personnel only will operate the appropriate geophysical instrument and identify MEC / UXO.
- An incremental geophysical survey of the drill-hole location(s) will be initially accomplished by the UXO team using a hand auger to install a pilot hole. If MEC / UXO is encountered or an anomaly cannot be positively identified as inert material, Hazardous, Toxic, and Radioactive Waste (HTRW) sampling personnel will select a new drill-hole location.
- Once the surface of a drilling site has been cleared and a pilot hole established as described above, the drilling contractor will be notified that the site is available for subsurface drilling.

4.21 Movement and Transport of Drilling, Boring or Direct-Push Equipment

4.21.1 Personnel transporting equipment shall be properly licensed and shall operate the vehicle according to Federal / State / Provincial / Territorial, and local regulations. Refer to *S3AM-005-PR1 Driving* and *S3AM-320-PR1 Commercial Motor Vehicles*.

4.21.2 Confirm the traveling height (overhead clearance), width, length and weight of the equipment with the carrier. Identify highway and bridge load, width and overhead limits, to confirm these limits are not exceeded and with adequate margin.

4.21.3 Allow for overhang of any drilling, boring or direct-push equipment when cornering or approaching other vehicles or structures.

4.21.4 Be aware that the canopies of service stations and motels are often too low for equipment loaded on a trailer to clear

4.21.5 Watch for low hanging electrical lines, particularly at the entrances to drilling sites or restaurants, motels, other commercial sites.

4.21.6 Never travel on a street, road, or highway with any part of the drilling, boring or direct-push equipment in a raised or partially raised position.

4.21.7 Remove all ignition keys if rig is left unattended unless client requirements specify that the keys remain in the ignition switch at all times.

4.21.8 Before moving a rig on location, the operator shall do the following:

- To the extent practical, walk the planned route of travel and inspect it for depressions, gullies, ruts, and other obstacles.
- Check the brakes of the truck / carrier, especially if the terrain along the route of travel is rough or sloped.
- Discharge all passengers before moving on rough or steep terrain.

4.21.9 Engage the front axle (on 4x4, 6x6, etc., vehicles) before traversing rough or steep terrain

4.21.10 Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator shall conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility shall be considered that the presence of drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).

4.21.11 Logs, ditches, road curbs, and other long and horizontal obstacles should be approached and driven over squarely, not at an angle.

4.21.12 When close lateral or overhead clearance is encountered, or when backing up, the driver of the rig shall be guided by another person on the ground.

4.21.13 Loads on the drill rig and truck shall be properly stored while the truck is moving, and the mast shall be in the fully lowered position.

4.22 Loading and Unloading

4.22.1 Consult applicable manufacturer's recommendations for loading and unloading of the equipment.

4.22.2 Use ramps of adequate design that are solid and substantial enough to bear the weight of the rig with carrier, including tools.

4.22.3 Load and unload on level ground.

4.22.4 Use the assistance of someone on the ground as a guide.

4.22.5 Check the brakes on the rig carrier before approaching loading ramps.

4.22.6 Distribute the weight of the rig, carrier, and tools on the trailer so that the center of weight is approximately on the centerline of the trailer and so that some of the trailer load is transferred to the height of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.

4.22.7 The rig and tools should be secured to the hauling vehicle with ties, chains, and / or load binders of adequate capacity.

5.0 Records

5.1 All employee training files shall be maintained in accordance with *S3AM-003PR1 SH&E Training*.

5.2 Completed inspections and maintenance inventories shall be maintained the site or project files.

6.0 Attachments

6.1 S3AM-321-ATT1 Core Drilling Machine

6.2 S3AM-321-ATT2 Pre-Drilling, Boring, & Direct-Push Probing Flow Chart

6.3 S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection

6.4 S3AM-321-FM2 Drilling, Boring & Direct-Push Equipment Maintenance Inventory

Americas

Underground Utilities

S3AM-331-PR1

1.0 Purpose and Scope

1.1 Provides procedures designed to help prevent injuries to personnel working on the location and pedestrians, property damage, and adverse environmental impact as a result of potential hazards associated with encountering underground utilities, subsurface installations, and potential overhead hazards.

1.2 Provides the minimum requirements to be followed for underground work (e.g., excavations, drilling, boring, and probing work) to ensure that underground installations, and subsurface structures, are identified properly before work commences.

1.3 This procedure applies to all Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

1.4 The Manager is responsible for meeting all the requirements in this procedure.

1.5 AECOM's clients may have specific procedures which shall be followed to identify and map utility and subsurface structures on their properties or facilities. Provided the client's procedures meet or exceed those of AECOM, approval shall be obtained from the Manager and the SH&E Manager to follow the client's procedures.

2.0 Terms and Definitions

2.1 **Underground Utilities –** All utility systems located beneath grade level, including, but not limited to, gas, electrical, water, compressed air, sewage, signaling and communications, etc.

2.2 **Clearance** – includes the following:

- The positive locating of underground utilities or subsurface installations in or near the work area.
- A signed statement by an appropriate representative attesting to the location of underground utilities and/or the positive de-energizing (including lockout) and testing of electrical utilities.

2.3 **Ground Disturbance (GD) –** Any indentation, interruption, intrusion, excavation, construction, or other activity in the earth's surface as a result of work that results in the penetration of the ground.

2.4 **Hand Clearance / Tolerance Zone –** The area on either side of the locate marks of a utility that shall be maintained in order to expose the utility through the use of non-destructive ground disturbance techniques acceptable to the owner of the buried utility and applicable jurisdictional requirements. Visual exposure is required before mechanical excavation equipment may be used.

2.5 **Intrusive Activities –** Examples: Excavation of soil borings, installations of monitoring wells, installation of soil gas sampling probes, excavation of test pits/trenches or other man-made cuts, cavity, trench or depression in an earth surface formed by earth removal.

2.6 **Non-Destructive Ground Disturbance Technique –** A safe and acceptable excavation method that is used to visually expose an underground utility without causing damage. Non-destructive ground disturbance techniques may include, but are not limited to:

- Hand digging.
- Use of non-conductive tools.
- Hydro-vacuum.

2.7 **Subsurface Installation –** Examples: Subterranean tunnels, underground parking garages and other structures beneath the surface.

2.8 **Utility Strikes –** Unplanned contact with utilities resulting in damage to the utility or its protective coating.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-303-PR1 Excavation

3.3 S3AM-321-PR1 Drilling, Boring & Direct-Push Probing

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

- Administer this procedure and the development of the SH&E Plan.
- Confirm the appropriate equipment and materials are available to conduct the underground utility and/or subsurface installation clearance.
- Confirm all employees involved and affected by the task review the SH&E Plan and Task Hazard Assessment (THA) prior to work commencing
- Authorize work to proceed using the *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist*.
- Confirm that employees conducting underground utilities and subsurface clearance processes possess all required training, registrations or certifications.
- Provide authorization (with the concurrence of the Site Supervisor and SH&E Manager) for work to resume if interrupted due to unexpected conditions or events.

4.1.2 **Safety, Health & Environment (SH&E) Manager**

- Assist AECOM management as needed by providing guidance and clarification as to issues that may arise.
- Review the SH&E Plan to confirm compliance with jurisdictional regulations. Provide technical guidance as needed when a variance is pursued related to this procedure.

4.1.3 **Employees**

- Maintain training as appropriate to the work to be completed (e.g. ground disturbance, lockout tagout, equipment operation, etc.). Refer to *S3AM-003-PR1 SH&E Training*.
- Review the SH&E Plan and Task Hazard Assessment (THA) prior to work commencing.
- As appropriate to the anticipated or encountered hazards and as addressed in the applicable planning documentation, utilize appropriate personal protective equipment (PPE) and applicable training, practices and operating procedures.
- Immediately notify the Manager of any unanticipated conditions or events. If assigned equipment, perform appropriate inspections and confirmations of maintenance and/or repairs.

4.2 Training

4.2.1 All on-site employees involved with the underground utility and subsurface identification and associated clearance process shall be trained, at a minimum, in these procedures.

4.2.2 Employees shall complete all required training associated with their tasks in accordance with the SH&E Training Matrix and any training assessments developed at the business group.

- Refer to *S3AM-003-PR1 SH&E Training.*
- This training may include, but is not limited to, Excavation / Trenching (Ground Disturbance), HAZWOPER, Petroleum Safety Training (or Construction Safety Training), and H2S Alive as appropriate.

4.2.3 As applicable, employees shall receive client-required training.

4.3 Planning

4.3.1 Health and Safety Plan – At a minimum, a SH&E Plan and task hazard assessments (THAs) shall be prepared prior to any underground utilities and subsurface installations clearance activities.

- The SH&E Plan will address any required environmental monitoring including gas monitoring, dust, noise, metals, radiation or other monitoring as may be appropriate for site conditions.
- Employees shall comply with all SH&E Plan requirements.
- The location specific emergency response plan shall be in place, contain procedures applicable to the potential emergencies presented by the operations, and be reviewed with all personnel potentially affected.

4.3.2 *S3AM-331-ATT2 Underground Utilities & Subsurface Installation Clearance Flow Chart* provides a summary of the key requirements addressed in this procedure.

4.3.3 Underground utilities and subsurface installations shall be investigated as being present, including the following, but not limited to:

- Steam, gas and electric.
- Sewer and water.
- Subterranean tunnels.
- Fibre optics (note: routine geophysical surveys will not identify fibre optic cables).
- Traffic control cables.

4.3.4 Location of underground utilities and subsurface installations will be confirmed by cross-referencing available information:

- Maps, as-built drawings and issued for construction (IFC) drawings.
- Plot plans, permits, crossing/encroachment agreements.
- One-Call information, locator and provided surveys.
- Private utility information, locator and provided surveys (e.g. ground penetrating radar (GPR), electromagnetic, etc.).
- Owner supplied documentation.
- Site walks.

4.3.5 As applicable, emergency shut-off locations of utilities shall be verified before work activities commence.

4.3.6 Jurisdictional, land owner, client and utility owner requirements shall be consulted to determine the minimum search zone dimensions and appropriate clearance distances.

4.3.7 As necessary and if possible, adjust locations of excavations or intrusive subsurface work away from subsurface utilities and installations

4.3.8 Prior to any excavation or intrusive subsurface work, the *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist* shall be completed. The form shall be reviewed and signed by the Manager.

- If the answer to any question in Part 1 of the checklist is “No” or “N/A”, no ground disturbance may take place without review by the Manager, in consultation with SH&E Manager, of the circumstances related to the particular item. The Manager shall initial beside each “No” or “N/A” item to indicate review and authorization.

4.4 Permits, Notifications and Access Agreements

4.4.1 Any required notifications shall be provided within the appropriate timeframe to the applicable organization (e.g. owner, utility company, agency, governing body, etc.).

4.4.2 All applicable permits (e.g. client, government, working near rail road, etc.) will be identified, obtained, and adhered to.

4.4.3 All access agreements will be obtained and adhered to.

4.5 Locating Underground Utilities and Subsurface Installations

4.5.1 Utilize the appropriate call/click-before-you-dig provider. Refer to *S3AM-331-ATT1 One-Call System*.

4.5.2 Federal/State/Provincial/Territorial and other “One Call” providers shall be contacted at least two working days and no more than ten working days prior to commencing the ground disturbance. Jurisdictional requirements shall be consulted to verify the appropriate advance notice. (e.g. 24 hours, two full working days, three to ten business days, etc.).

4.5.3 If the location of proposed excavation or intrusive subsurface work cannot be clearly and adequately identified, the route and/or area of the proposed ground disturbance shall be identified using white flags, paint or stakes prior to the arrival of the locator. Consult jurisdictional requirements as white-lining may be a mandatory requirement on all ground disturbances.

4.5.4 One Call providers shall appropriately identify and mark the subsurface utilities or installations, or otherwise provide written notification they do not have any facilities near the proposed subsurface/intrusive locations.

4.5.5 Confirm all circuits were on during subsurface checks if the checks were for identifying energized lines (e.g. circuits on timers or light sensing switches).

4.5.6 Areas that have a high density of sub-surface facilities may require a secondary locate by another independent locator to verify locations identified by the first locator.

4.6 Private Utility Locating

4.6.1 One Call services may not be available in various non-urban locations. Private utility locating companies shall be utilized to identify and located any underground utilities or subsurface installations.

4.6.2 Be aware urban areas (e.g. city or town) may have subsurface installations (e.g. underground garages) and utilities (e.g. public water, sewer, and gas pipelines) that are not covered by one-call systems.

- These subsurface installations and utilities require additional investigation and diligence beyond the one-call system.
- Additional investigation and diligence beyond the one-call system is also recommended for non-urban areas.

4.6.3 In urban areas, private utility locating companies shall be called to identify and locate, through geophysical surveys and other means, the presence of private utilities installed by the property owner (e.g. irrigation systems) and to verify the presence of public utilities on the properties.

- Hand clearance / tolerance zones shall be observed in urban areas and utilities exposed through the use of non-destructive techniques in accordance with requirements of the applicable jurisdiction and utility owner.

4.6.4 Observance of hand clearance / tolerance zones and utility exposure using non-destructive techniques is also recommended for non-urban areas and may be required by the applicable jurisdiction.

4.6.5 Warning tape, pea gravel, sand, non-indigenous material, bentonite, red concrete (indicative of electrical duct banks) and any departure from native soil or backfill may be evidence of the presence of subsurface installations and utilities.

4.7 Surface Markings

4.7.1 Once the underground installation has been identified, proper surface markings shall be made in accordance with the guidelines from the One-Call System (refer to S3AM-331-ATT1), guidance contained in this procedure or as contract-specified.

4.7.2 Color-coded surface marks (paints or similar coatings) shall be used to indicate the type, location, and route of buried installations. Additionally, to increase visibility, color-coded vertical markers (temporary stakes or flags) shall supplement surface marks.

4.7.3 All marks and markers shall indicate the name, initials, or logo of the company that owns or operates the installation and the width of the installation if it is greater than 2 inches.

4.7.4 If the surface over the buried installation is to be removed, supplemental offset marking shall be used. Offset markings shall be on a uniform alignment and shall clearly indicate that the actual installation is a specific distance away.

4.7.5 Locate marks shall be re-verified as per jurisdictional requirements or no later than 14 days after the previous locate was completed, whichever interval is shorter. These locate time intervals shall be maintained for the duration of the ground disturbance.

- If the work is interrupted during the determined lifespan or work does not commence during the applicable lifespan, a new locate shall be performed.
- Jurisdictional provisions may allow for an extension to the lifespan of the locate marks, however certain conditions may need to be met. (e.g. activities uninterrupted)
- If locate marks are moved or destroyed the location of the buried facilities shall be re-established.

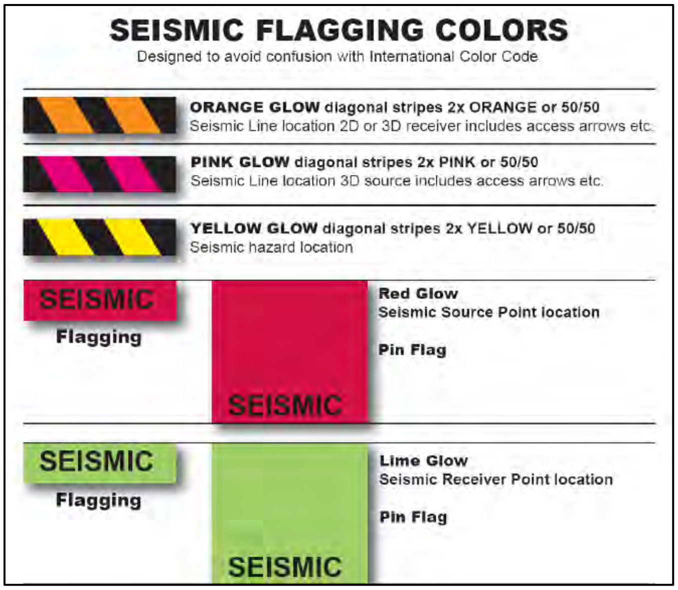
4.8 Uniform Color Coding

4.8.1 The colors and corresponding installation type are as follows unless otherwise contract-specified:

AMERICAN PUBLIC WORKS ASSOCIATION – APWA
Color Coding for Marking of Buried Facilities

White	**Proposed Ground Disturbance Area**
Pink	**Temporary Survey Markings**
Red	**Electric Power Lines, Cables, Conduit and Lighting Cables**
Yellow	**Gas, Oil, Steam, Petroleum Lines or Gaseous Materials**
Orange	**Conduit, Cable, Communication, Alarm or Signal Lines**
Blue	**Potable Water**
Green	**Sewer, Storm Sewer and Drain Lines**
Purple	**Reclaimed Water, Irrigation and Slurry Lines (non-potable)**

Canadian Association of Geophysical Contractors



4.9 Identification and Mapping of Utility and Subsurface Structures

4.9.1 The locations of subsurface utilities and subsurface installations shall be investigated, documented, and shown on a site plan (a scaled site plan shall be used when feasible). Refer to *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist.*

4.9.2 Documentation of utility and subsurface installation identification (calling one call, responses from utilities) along with the scaled site plan shall be available on the worksite at all times of intrusive activities.

4.10 Site Walk

4.10.1 A site walk shall be conducted by the AECOM Manager and any other appropriate personnel with the objectives of reviewing all planned intrusive activity locations, the locations of subsurface and overhead utilities, overhead obstructions, and the potential for subsurface installations, to determine the appropriate utility clearance activities, and to observe other physical hazards.

- Walk the area at least 50 feet (15.2 meters) from perimeter of the site to observe physical hazards.
- Walk the area of at least 50 feet (15.2 meters) radius from each proposed subsurface intrusion location.
- If possible, particularly at urban and industrial sites, the client/property owner or an individual knowledgeable about the site and site utilities will attend the site walk.
- Add discovered items/issues to map for use in location confirmation.

4.10.2 The Site Walk further supplements the Identification and Mapping of Utility and Subsurface Structures procedure. Site Walks should be repeated as necessary following the Identification and Mapping of Utility and Subsurface Structures as visual verification of the hazards. Examples include:

- Proposed location(s) does not lie on a line connecting two similar manhole covers (e.g. sanitary sewer or storm drain).
- Proposed subsurface location(s) has not subsided, been excavated and patched, nor gives the appearance it may be covering a former trench (e.g. linear cracks, sagging curbs, linear re-pavements, etc.).
- Proposed subsurface location(s) does not lie on a line with any water, gas, electrical meters, utility cleanouts, or other utility boxes in the surrounding areas.

4.11 Proposed Subsurface Investigation Locations

4.11.1 All proposed subsurface locations will be reviewed in comparison to subsurface and overhead utilities and subsurface installations and adjustments made as necessary.

4.11.2 Minimum set back distances from subsurface and overhead utilities and subsurface installations will be established including 5 feet (1.5 meters) from any subsurface utility, 7 feet (2.1 meters) from the pad surrounding any underground storage tanks, and 10 feet (3 meters) from any overhead energized electrical line (or further depending on line voltage). These set back distances are a minimum; government regulations and utility requirements may dictate a greater set back distance.

4.12 Utility Clearance Investigation Location Confirmation

4.12.1 As applicable, all client on-site safety procedures shall be understood and adhered to.

4.12.2 Hand exposure or non-destructive ground disturbance techniques to expose an underground utility or subsurface installation are necessary to accurately determine size, location and alignment prior to mechanical excavation or intrusive subsurface work in the vicinity of that utility or installation.

4.12.3 Non-destructive ground disturbance techniques shall be acceptable to the owner of the buried utility (i.e. hydro-vacuum temperature or pressure).

4.12.4 Hydro-vacuum or air-knife require proper grounding equipment at sites where the subsurface may contain flammable gases, liquids, or vapors

4.12.5 Jurisdictional, land owner, client and utility owner requirements shall be consulted to determine the distance of the hand exposure zone, and what requirements, when met, may allow mechanical excavation within these zones.

4.12.6 At a minimum, all underground utilities and subsurface installations within a 5 feet (1.5 meter) radius of the work site shall be identified and physically located (seen) before use of mechanical excavation equipment is permitted. Jurisdictional, client, land owner and utility owner requirements shall be consulted as the required hand exposure radius may be larger.

4.12.7 In urban areas, proposed subsurface locations will be cleared by hand / non-destructive technique to 5 feet (1.5 meters) (soil borings and wells) or 12 inches (30 centimeters) (soil gas sampling probes) using non-mechanical methods.

- In non-urban areas, clearing by hand / non-destructive technique should be conducted if possible and shall be conducted as required by the given jurisdiction.
- Hand / non-destructive technique clearance should be extended if locations of deep utilities and structures are not known.
- Hand exposure or non-destructive ground disturbance techniques should extend a minimum of 24 inches (60 centimeters) below the intended ground disturbance depth to minimize the hazard of mechanical equipment contact with any utility or installation.

4.12.8 Mechanical equipment and attachment dimensions shall be considered when establishing the zone in which all underground utilities and subsurface installations are physically located (seen) prior to the use of that equipment. The radius may require expanding to maintain safe distances when using large equipment.

4.13 Utility Strikes

4.13.1 Utility strikes shall be reported in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*.

4.13.2 All damaged utilities shall be repaired by a qualified and/or licensed professional.

5.0 Records

5.1 Retain completed *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist* and documents related the clearance process (e.g. Utility Owner communication, etc.) in the site or project files.

5.2 Documentation of employee training completed shall be retained in accordance with *S3AM-003-PR1 SH&E Training*.

6.0 Attachments

6.1 S3AM-331-ATT1 One-Call System

6.2 S3AM-331-ATT2 Underground Utilities & Subsurface Installation Flow Chart

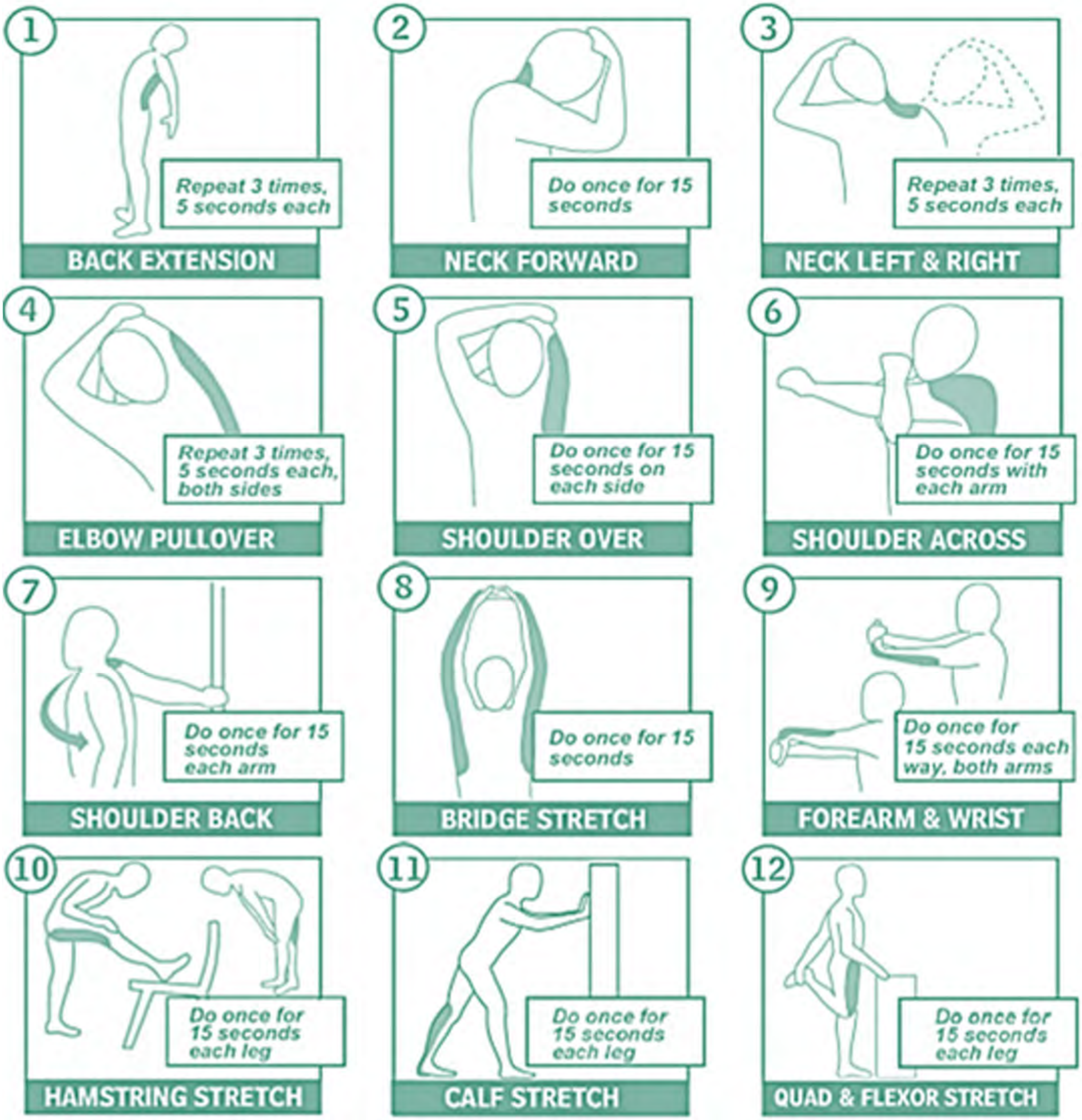
6.3 S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist

Attachment E

Stretch/Flex Poster

Attachment E: Stretch/Flex Poster

Examples of Stretches



Attachment F

Site Safety Orientation

Attachment F: Site Safety Orientation

AECOM will conduct a site safety briefing for a person's initial visit to the site. The briefing will be conducted:

- Prior to the start of work;
- For any new AECOM or subconsultant personnel;
- For Site Visitors; and
- At each mobilization, or whenever there is a change in task or significant change in task location.

All personnel working on the project who have received the site briefing (including the SWP review) will sign the Personal Acknowledgement located in **Section 18**. Visitors may receive a shortened version to address the hazards specific to their visit.

The following topics, at minimum, will be discussed during the site safety briefing:

- Contents of this SWP;
- The Emergency Response Plan (Table 7-1);
- Contractor SHE Management expectations;
- Injury management, including notification and hospital and occupational clinic locations;
- The AECOM 4-Sight program;
- Stop Work authority;
- The THAs (**Attachment C**) for the activities that will be performed on a given job;
- Types of hazards at the site and means for minimizing exposure to them;
- Instructions for new operations to be conducted, and safe work practices;
- PPE that must be used;
- Lone worker check-in procedures;
- Emergency evacuation routes, muster points, and tornado/storm shelters; and
- Location and use of emergency equipment.
- **These briefings must be documented and maintained in the project files.**

Attachment G

Safety Data Sheets

Attachment G: Safety Data Sheets

SAFETY DATA SHEET

Version 5.12
Revision Date 06/02/2016
Print Date 01/23/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Alconox® detergent
Product Number	:	242985
Brand	:	Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	+1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Skin irritation (Category 2), H315
Serious eye damage (Category 1), H318
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.

P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Hazardous components

Component		Classification	Concentration
Sodium dodecylbenzenesulfonate			
CAS-No. EC-No.	25155-30-0 246-680-4	Acute Tox. 4; Skin Irrit. 2; Eye Dam. 1; Aquatic Acute 2; H302, H315, H318, H401	>= 30 - < 50 %
Tetrasodium pyrophosphate			
CAS-No. EC-No.	7722-88-5 231-767-1	Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; H315, H319, H335	>= 30 - < 50 %
Sodium carbonate			
CAS-No. EC-No. Index-No.	497-19-8 207-838-8 011-005-00-2	Eye Irrit. 2A; H319	>= 10 - < 20 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Tetrasodium pyrophosphate	7722-88-5	TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance — Form: granular, powder
Colour: white

b)	Odour	odourless
c)	Odour Threshold	No data available
d)	pH	9.5 at 10 g/l
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	soluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Sulphur oxides, Oxides of phosphorus, Sodium oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Sodium dodecylbenzenesulfonate	25155-30-0	1993-04-24
Tetrasodium pyrophosphate	7722-88-5	2007-03-01
Pentasodium triphosphate	7758-29-4	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Sodium dodecylbenzenesulfonate	25155-30-0	1993-04-24
Tetrasodium pyrophosphate	7722-88-5	2007-03-01
Pentasodium triphosphate	7758-29-4	1993-04-24
Sodium carbonate	497-19-8	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Sodium dodecylbenzenesulfonate	25155-30-0	1993-04-24
Tetrasodium pyrophosphate	7722-88-5	2007-03-01
Pentasodium triphosphate	7758-29-4	1993-04-24
Sodium carbonate	497-19-8	

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Eye Dam.	Serious eye damage
Eye Irrit.	Eye irritation
H302	Harmful if swallowed.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.
Skin Irrit.	Skin irritation
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.12   Revision Date: 06/02/2016   Print Date: 01/23/2017

SANEX CHEMICALS, INCORPORATED -- DEET (INSECT REPELLANT) -- 6840-00-753-4963

===================== Product Identification =====================

Product ID:DEET (INSECT REPELLANT)
MSDS Date:01/01/1987
FSC:6840
NIIN:00-753-4963
MSDS Number: BFNFR
=== Responsible Party ===
Company Name:SANEX CHEMICALS, INCORPORATED
Address:21 WEBSTER STREET
City:NORTH TONAWANDA
State:NY
ZIP:14120-5809
Country:US
Info Phone Num:416-677-4890 - CANADA #
Emergency Phone Num:716-694-9325
CAGE:1EW21
=== Contractor Identification ===
Company Name:SANEX CHEMICALS, INC.
Address:15 WEBSTER STREET
Box:City:NORTH TONAWANDA
State:NY
ZIP:14120
Country:US
CAGE:1EW21

============= Composition/Information on Ingredients =============

Ingred Name:N,N'-DIETHYL-M-TOLUAMIDE CONTAINING 5% RELATED COMPOUNDS.
CAS:134-62-3
RTECS #:XS3675000
Fraction by Wt: 75%.

Ingred Name:ETHYL ALCOHOL (ETHANOL)
CAS:64-17-5
RTECS #:KQ6300000
Fraction by Wt: 25%.
OSHA PEL:1000 PPM
ACGIH TLV:1000 PPM; 9192

===================== Hazards Identification =====================

LD50 LC50 Mixture:LD50 (ORAL RAT) = 2000 MG/KG
Routes of Entry: Inhalation:YES Skin:NO Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:NOT KNOWN
Effects of Overexposure:INHALATION AND SWALLOWING CAN CAUSE DIZZINESS,DROWSINESS,NAUSEA AND VOMITING.

======================= First Aid Measures =======================

First Aid:INHALATION: REMOVE TO FRESH AIR. IF NOT BREATHING GIVE CPR; IF BREATHING DIFFICULT GIVE OXYGEN. EYE:IMMEDIATELY FLUSH WITH PLENTY OF WATER. SKIN: WASH WITH SOAP & WATER. REMOVE CONTAMINATED CLOTHING & SHOES. INGESTION: DO NOT INDUCE VOMITING. NOTHING BY MOUTH IF UNCONSCIOUS.

==================== Fire Fighting Measures ====================

Flash Point Method:TCC
Flash Point:73F,23C
Extinguishing Media:CARBON DIOXIDE, FOAM, DRY CHEM.
Fire Fighting Procedures:NONE
Unusual Fire/Explosion Hazard:NOT ESTABLISHED.

================== Accidental Release Measures ==================

Spill Release Procedures:LARGE SPILL (> GAL): REMOVE IGNITION SOURCES,VENTILATE AREA WELL.ABSORB WITH VERMICULITE OR OTHER MATERIALS, SUCH AS SAWDUST, RAGS, PAPER & PLACE IN CLOSED CONTAINER. USE NON SPARKING TOOLS. WEAR PROP ER PROTECTIVE EQUIPMENT DURING CLEAN UPPROCEDURES

===================== Handling and Storage =====================

Handling and Storage Precautions:NONE NORMALLY REQUIRED. KEEP CONTAINERS TIGHTLY CLOSED.
Other Precautions:AVOID REPEATED USE OF THE PRODUCT. READ INSTRUCTIONS BEFORE USE.

============= Exposure Controls/Personal Protection =============

Respiratory Protection:NONE NORMALLY REQUIRED.
Ventilation:GENERAL ROOM VENTILATION. FOR BULK HANDLING: LOCAL EXHAUST TO ELIMINATE MISTS/FUMES/GASES.
Protective Gloves:IF NEEDE, USE RUBBER GLOVES
Eye Protection:IF NEEDED, USE SAFETY/CHEM GOGGLES
Other Protective Equipment:NONE
Supplemental Safety and Health
MSDS RECEIVED FROM SANEX WAS UNDATED. ACUTE ORAL LD50 RAT=2000MG/KG/. AT THE TIME (6/25/90) OF UPDATE THIS ENTRY, SUPPLIER DID NOT HAVE MSDS FOR THIS PRODUCT. HEATH/SPILL DATA ESTABLISHED BY DGSC.

================== Physical/Chemical Properties ==================

HCC:F3
Boiling Pt:B.P. Text:171F,77C
Vapor Pres:31.
Spec Gravity:0.9414
Evaporation Rate & Reference:1.7
Appearance and Odor:CLEAR LIQUID,VERY MILD ODOR.

================= Stability and Reactivity Data =================

Stability Indicator/Materials to Avoid:YES
Stability Condition to Avoid:VERY HIGH TEMP.
Hazardous Decomposition Products:INCOMPLETELY BURNED CARBON PRODUCTS, CO*2, CO.

==================== Disposal Considerations ====================

Waste Disposal Methods:KEEP IN COVERED DRUMS,PENDING DISPOSAL. HANDLE & DISPOSE IN FULL COMPLIANCE WITH ALL APPLICABLE INTERNATIONAL,FEDERAL,STATE, & LOCAL REGULATIONS.

of Defense. The United States of America in no manner whatsoever, expressly or implied, warrants this information to be accurate and disclaims all liability for its use. Any person utilizing this document should seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation.

CHEVRON -- UNLEADED GASOLINE, CPS201110 -- 9130-00N018990

===================== Product Identification =====================

Product ID:UNLEADED GASOLINE, CPS201110
MSDS Date:03/06/1991
FSC:9130
NIIN:00N018990
MSDS Number: CFZGX
=== Responsible Party ===
Company Name:CHEVRON
Box:4054
City:RICHMOND
State:CA
ZIP:94804
Country:US
Info Phone Num:800-582-3835
Emergency Phone Num:800-582-3835
CAGE:0AHD1
=== Contractor Identification ===
Company Name:CHEVRON ENVIRONMENTAL HEALTH CENTER INC
Address:15299 SAN PABLO AVE
Box:4054
City:RICHMOND
State:CA
ZIP:94804
Country:US
Phone:800-582-3835
CAGE:0AHD1

============= Composition/Information on Ingredients =============

Ingred Name:ING 12:BE EPIGENETIC PROCESS UNIQUE TO FEMALE MOUSE. INHAL EXPOS TO WHOLE GAS VAP ALSO CAUSED KIDNEY DMG & (ING 14)
RTECS #:9999999ZZ

Ingred Name:ING 13:EVENTUALLY KIDNEY CANCER IN MALE RATS. NOTE:TOLUENE APPEARS ON NAVY LIST OF OCCUP CHEM REPRO HAZS. SEEK (ING 15)
RTECS #:9999999ZZ

Ingred Name:ING 14:CONSULTATION FROM APPROP HLTH PROFESSIONALS CONCERNING LATEST HAZ LIST INFO & SAFE HNDLG & EXPOS INFO (ING 16)
RTECS #:9999999ZZ

Ingred Name:ING 15:. FOR MORE COMPLETE INFORMATION, CONTACT NEHC .
RTECS #:9999999ZZ

Ingred Name:FIRST AID PROC:OBTAINED, THEN TAKE PERS & PROD CNTNR TO NEAREST MED EMER TREATMENT CENTER/HOSPITAL. NOTE TO MD: (ING 18)
RTECS #:9999999ZZ

Ingred Name:ING 17:INGESTION OF THIS PRODUCT OR SUBSEQUENT VOMITING CAN RESULT IN ASPIRATION WHICH CAN CAUSE PNEUMONITIS.
RTECS #:9999999ZZ

Ingred Name:SPILL PROC:REPORTING SPILLS OF THIS MATL THAT COULD REACH ANY SURF WATERS. TOLL FREE NUMBER FOR U.S. COAST GUARD(ING 20)
RTECS #:9999999ZZ

Ingred Name:ING 19:NATIONAL RESPONSE CENTER IS (800) 424-8802.
RTECS #:9999999ZZ

Ingred Name:WASTE DISP METH:CONTAM MATLS IN DISPOSABLE CNTNRS & DISPOSE OF IN A MANNER CONSISTENT W/APPLIC REGS. CONT LOC (ING 22)
RTECS #:9999999ZZ

Ingred Name:ING 21:ENVIRONMENTAL OR HEALTH AUTHORITIES FOR APPROVED DISPOSAL OF THIS MATERIAL.
RTECS #:9999999ZZ

Ingred Name:ING 11:LIVER TUMORS IN FEMALE MICE. MECHANISM OF THIS RESPONSE IS STILL BEING INVESTIGATED BUT IT IS THOUGHT TO (ING 13)
RTECS #:9999999ZZ

Ingred Name:GASOLINE
CAS:8006-61-9
RTECS #:LX3300000
Fraction by Wt: 100%
OSHA PEL:300 PPM
ACGIH TLV:300 PPM;500 STEL

Ingred Name:BENZENE, ETHYL-; (ETHYLBENZENE) (SARA 313)
CAS:100-41-4
RTECS #:DA0700000
Fraction by Wt: <1.4%
OSHA PEL:100 PPM
ACGIH TLV:100 PPM;125 STEL
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:P-XYLENE; (P-DIMETHYLBENZENE) (SARA 313) (CERCLA)
CAS:106-42-3
RTECS #:ZE2625000
Fraction by Wt: <0.9%
OSHA PEL:100 PPM
ACGIH TLV:100 PPM;150 STEL
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:M-XYLENE; (M-DIMETHYLBENZENE) (SARA 313) (CERCLA)
CAS:108-38-3
RTECS #:ZE2275000
Fraction by Wt: <4.6%
OSHA PEL:100 PPM
ACGIH TLV:100 PPM;150 STEL
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:O-XYLENE; (O-DIMETHYLBENZENE) (SARA 313) (CERCLA)
CAS:95-47-6
RTECS #:ZE2450000
Fraction by Wt: <2.2%
OSHA PEL:100 PPM
ACGIH TLV:100 PPM;150 STEL
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:TOLUENE (SARA 313) (CERCLA)
CAS:108-88-3

RTECS #:XS5250000
Fraction by Wt: <6.5%
OSHA PEL:200 PPM
ACGIH TLV:50 PPM, S
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:HEXANE; (N-HEXANE) (CERCLA)
CAS:110-54-3
RTECS #:MN9275000
Fraction by Wt: <3%
OSHA PEL:500 PPM
ACGIH TLV:50 PPM
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:CYCLOHEXANE (SARA 313) (CERCLA)
CAS:110-82-7
RTECS #:GU6300000
Fraction by Wt: <2.4%
OSHA PEL:300 PPM
ACGIH TLV:300 PPM
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:METHYL TERT-BUTYL ETHER (SARA 313) (CERCLA)
CAS:1634-04-4
RTECS #:KN5250000
Fraction by Wt: <15%
OSHA PEL:N/K
ACGIH TLV:N/K
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:BENZENE (SARA 313) (CERCLA). OSHA PEL:1 PPM TWA; 5 PPM STEL
(MFR).
CAS:71-43-2
RTECS #:CY1400000
Fraction by Wt: <4.9%
OSHA PEL:SEE INGREDIENT
ACGIH TLV:10 PPM
EPA Rpt Qty:10 LBS
DOT Rpt Qty:10 LBS

Ingred Name:SUPDAT:(CALLED ASPIR). CAN CAUSE SEV INJURY TO LUNGS &
DEATH. LIFETIME INHAL OF WHOLE GAS VAP HAS CAUSED INCR (ING 12)
RTECS #:9999999ZZ

===================== Hazards Identification =====================

LD50 LC50 Mixture:LD50:(ORAL,RAT) >5 ML/KG.
Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:YES
Health Hazards Acute and Chronic:EYE CONT:SLIGHTLY IRRIT & COULD CAUSE
PRLNG (DAYS) IMPAIRMENT OF VISION. SIGNS & SYMPS MAY INCL PAIN,
TEARS, SWELL, REDNESS & BLURRED VISION. VAPS, FUMES/SPRAY MIST
COULD ALSO CAUSE SIMILAR SIGNS & SY MPS. SKIN IRRIT:RPTD CONT MAY
CAUSE SKIN TO CRACK/DRY FROM DEFAT ACTION. INHAL:SLIGHTLY TOX.
TARGET (EFTS OF OVEREXP)
Explanation of Carcinogenicity:BENZENE:IARC MONOGRAPHS, SUPP, VOL 7, PG

120, 1987:GRP 1. NTP 7TH ANNUAL RPT ON CARCINS, 1994:KNOWN TO BE (SUPP DATA)
Effects of Overexposure:HLTH HAZ:ORGAN:NERV SYS. CONCS >1000 PPM MAY CAUSE CNS EFTS SUCH AS HDCH, DIZZ, LOSS OF APPETITE, WEAK & LOSS OF COORD. CONCS >5000 PPM MAY CAUSE LOSS OF CONSCIOUSNESS, COMA & DEATH. INGEST:SLIGHTLY T OX IF SWALLOWED. TARGET ORGAN:NERV SYS.SIGNS & SYMPS OF CNS EFTS MAY INCL HDCH, DIZZ, LOSS OF APPETITE, WEAK & (SUPDAT)
Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

======================= First Aid Measures =======================

First Aid:EYES:FLUSH IMMED W/FRESH WATER FOR AT LST 15 MINS WHILE HOLDING LIDS OPEN. REMOVE CONT LENSES IF WORN. IF IRRIT PERSISTS, SEE MD. SKIN:WASH THORO W/SOAP & WATER. REMOVE & WASH CONTAM CLTHG. INHAL:MOVE TO FRESH AIR. IF ANY EFTS CONTINUE, SEE MD. INGEST:GIVE WATER/MILK TO DRINK & TELEPHONE FOR MED ADVICE. DO NOT MAKE PERS VOMIT UNLESS DIRECTED TO DO SO BY MED PERS. IF MED ADVICE CANNOT BE (ING 17)

===================== Fire Fighting Measures =====================

Flash Point Method:PMCC
Flash Point:<-49F,<-45C
Lower Limits:1.4%
Upper Limits:7.6%
Extinguishing Media:FIRE FIGHTING FOAM:ALCOHOL RESISTANT TYPE (AR). AFFF, CO*2, DRY CHEMICAL.
Fire Fighting Procedures:USE NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT .
Unusual Fire/Explosion Hazard:EXTREME FIRE HAZ. LIQ VERY QUICKLY EVAPS, EVEN AT LOW TEMPS & FORMS VAP (FUMES) WHICH CAN CATCH FIRE & BURN W/EXPLO VIOLENCE. INVISIBLE VAP SPREADS (SUPP DATA)

================== Accidental Release Measures ==================

Spill Release Procedures:ELIM ALL SOURCES OF IGNIT. CLEAN UP SPILLS IMMED, OBSERVING PRECS IN PROT EQUIP SECTION. MATL IS CONSIDERED TO BE WATER POLLUTANT & RELS SHOULD BE PREVENTED FROM CONTAM SOIL & WATER & FROM ENTERING DR AINAGE & SEWER SYS. U.S.A. REGS REQ (ING 19)
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

====================== Handling and Storage ======================

Handling and Storage Precautions:USE ONLY AS MOTOR FUEL. DO NOT USE FOR CLEANING, PRESS APPLIANCE FUEL/ANY OTHER SUCH USE. USE ONLY IN WELL VENTED AREA. KEEP OUT OF REACH OF CHILDREN.
Other Precautions:DO NOT USE/STORE NEAR FLAME, SPKS/HOT SURFS. KEEP CNTNR CLSD. DO NOT TRANSFER LIQ TO UNLABELED CNTNR. DO NOT WELD, HEAT/DRILL CNTNR. REPLACE CAP/BUNG. EMPTIED CNTNR STILL CNTNS HAZ/EXPLO VAP/LIQ. READ & OBSERVE ALL PRECS ON PROD LABEL.

============= Exposure Controls/Personal Protection =============

Respiratory Protection:NO SPECIAL PROTECTION IS NORMALLY REQUIRED. HOWEVER, IF OPERATING CONDITIONS CREATE AIRBORNE CONCENTRATIONS WHICH EXCEED RECOMMENDED EXPOSURE STANDARDS, USE OF A NIOSH APPROVED RESPIRATOR IS REQUIRED.
Ventilation:USE ONLY IN WELL VENTILATED AREAS.

Protective Gloves:IMPERVIOUS GLOVES .
Eye Protection:ANSI APPROVED CHEM WORKERS GOGGS .
Other Protective Equipment:ANSI APPROVED EYE WASH FOUNTAIN & DELUGE SHOWER . CONTACT CAN BE MINIMIZED BY WEARING PROTECTIVE CLOTHING.
Work Hygienic Practices:NONE SPECIFIED BY MANUFACTURER.
Supplemental Safety and Health
EXPLO HAZ:EASILY & CAN BE SET ON FIRE BY MANY SOURCES SUCH AS PILOT LIGHTS, WELDING EQUIP & ELEC MOTORS & SWITCHES. EXPLAN OF CARCIN:CARCIN. OSHA REGULATED:29 CFR 1910.1028. HUMAN:MYELOID LEUKEMIA, HO DGKINS DISEASE, LYMPHOMA. EFTS OF OVEREXP:LOSS OF COORD. SUBSTANCE CAN DIRECTLY ENTER LUNGS IF IT IS SWALLOWED (ING 11)

================== Physical/Chemical Properties ==================

Boiling Pt:B.P. Text:>77F,>25C
Vapor Pres:5-15 @100F
Vapor Density:3-4
Spec Gravity:0.7-0.8
Solubility in Water:INSOLUBLE
Appearance and Odor:ORANGE TO BRONZE LIQUID.
Percent Volatiles by Volume:>99

================= Stability and Reactivity Data =================

Stability Indicator/Materials to Avoid:YES
MAY REACT W/STRONG OXIDIZING AGENTS, SUCH AS CHLORATES, NITRATES, PEROXIDES, ETC.
Stability Condition to Avoid:NEVER SIPHON GASOLINE BY MOUTH.
Hazardous Decomposition Products:NORMAL COMBUSTION FORMS CARBON DIOXIDE & WATER VAPOR; INCOMPLETE COMBUSTION CAN PRODUCE CARBON MONOXIDE.

==================== Disposal Considerations ====================

Waste Disposal Methods:DISP MUST BE I/A/W FED, STATE & LOC REGS . CLEAN UP SM SPILLS USING APPROP TECHNIQUES SUCH AS SORBENT MATLS/PUMPING. WHERE FEASIBLE & APPROP, REMOVE CONTAM SOIL. FOLLOW PRESCRIBED PROCS FOR REPO RTING & RESPONDING TO LGR RELS. PLACE (ING 21)

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Hydrochloric Acid, 31 – 36%

Product Name: Hydrochloric Acid, 31 – 36.7%

Identified Uses: acid etching, steel pickling, oil and gas, ore and mineral, food processing, pharmaceutical, organic chemical synthesis

Company Information:
ASHTA Chemicals Inc.
P.O. Box 858
Ashtabula Ohio 44005
Phone: (440) 997-5221
Fax: (440) 998-0286
24-hour Emergency Phone: CHEMTREC: (800) 424-9300

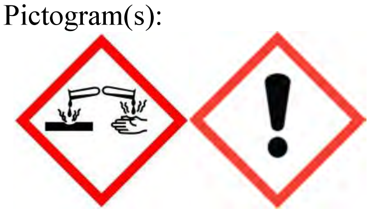
SECTION 2: HAZARDS IDENTIFICATION

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

GHS label elements, including precautionary statements:

Signal Word: **Danger**

Pictogram(s):



Hazard Statements	
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.
Precautionary Statements	
P234	Keep only in original container.
P261	Avoid breathing dust/ fume/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water. Shower.

P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container with a resistant inner liner.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms:

CHEMICAL NAME:	Hydrochloric acid
TRADE NAME:	Hydrochloric acid, 31 – 36%
SYNONYMS:	Muriatic acid, Chlorohydric acid, Hydrogen Chloride
C.A.S:	7647-01-0
EC:	231-595-7
WHMIS:	D2A, E
CHEMICAL FORMULA:	HCl (in aqueous solution)
CHEMICAL FAMILY:	Inorganic Acid

SECTION 4 FIRST AID MEASURES

Description of first aid measures:
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give humidified air. Give oxygen, but only by a certified physician. Consult a physician.

In case of skin contact
Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Remove contact lenses if present and easy to do. Continue rinsing eyes during transport to medical facility.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Consult a physician.

SECTION 5 FIRE FIGHTING MEASURES

Flash Point (Method):	Non-combustible.
Extinguishing Media:	Use extinguishing agents compatible with acid and appropriate for the burning material. Use water spray to keep fire-exposed containers cool.
Auto Ignition Temp:	Non-combustible.
Special Fire Fighting Procedures:	Wear self-contained breathing apparatus and full protective clothing. In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials.
Unusual Fire/Explosion Hazards:	Releases flammable hydrogen gas when reacting with metals.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Environmental Precautions:
Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Avoid discharge into drains, water courses or onto the ground.

Containment and Cleaning:
Follow preplanned emergency procedures. Only properly equipped, trained, functional personnel should attempt to contain a leak. All other personnel should be evacuated from the danger area. Using full protective equipment, apply appropriate emergency device or other securement technology to stop the leak if possible.

Small Spill:	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: neutralize the residue with a dilute solution of sodium carbonate.
Large Spill:	Corrosive liquid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to knock down vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that vapor is not present at a concentration level above TLV.

SECTION 7: HANDLING AND STORAGE

Precautions to be taken for handling and storage:
Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Do not breathe mist or vapor. Observe good industrial hygiene practices. Do not empty into drains. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes. Store in a well-ventilated place. Store away from incompatible materials. Store closed containers in a clean, cool, open or well ventilated area. Keep out of sun.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Principal Component: Hydrochloric Acid
Occupational Exposure Limits:
Regulatory Limits:

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrochloric Acid Mixture	---	---	5 ppm 7.59 mg/m^3

ACGIH TLV = 5 ppm (7.59 mg/m^3) TWA

NIOSH IDLH = 50 ppm (as HCl, 2010)

Exposure Controls:

Eye Protection: Tightly fitting safety goggles. Face shield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Respiratory Protection: Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Other Protection: Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Ventilation Recommended: Exhaust ventilation is required to meet PEL limits.

Glove Type Recommended: Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

Appearance	Colorless to light yellow liquid
Odor	Pungent (irritating/strong)
Odor Threshold	0.3ppm (can cause olfactory fatigue)
pH	<1 (in aqueous solution)
Melting point/freezing point	-30°C (-22°F)
Initial boiling point	>100°C (>212°F)
Flash point	Not applicable
Auto-ignition Temp	Not applicable
Evaporation rate	No data available

Decomposition temperature	No data available
Flammability (solid, gas)	Not combustible
Upper/lower flammability or explosive limits	Not combustible
Water solubility	100%
Molecular Weight	36.46
Relative Density (Specific Gravity)	1.16 (32% HCl solution) 1.19 (36.5% HCl solution)
Bulk Density	8.75 lbs/gal (32% HCl solution) 9.83 lbs/gal (36.5% HCl solution)
Vapor Density (air = 1)	1.267 at 20 °C
Vapor Pressure	84 mm Hg @ 20°C
Partition Coefficient: n-octanol/water	No data available

SECTION 10: STABILITY AND REACTIVITY

Stability: Hydrochloric acid is stable under normal conditions and pressures.

Conditions to avoid: Incompatible materials, metals, excess heat, bases.

Incompatibility: Bases, amines, metals, permanganates, (e.g. potassium permanganate), fluorine, metal acetylides, hexalithium disilicide.

Hazardous decomposition products: Hydrogen chloride, chlorine, hydrogen gas.

Polymerization: Hazardous polymerization WILL NOT occur.

SECTION 11: TOXICOGICAL INFORMATION

Information on likely routes of exposure:

Inhalation: Vapors and mist will irritate throat and respiratory system and cause coughing.

Skin contact: Causes skin burns.

Eye contact: Causes eye burns.

Ingestion: Harmful if swallowed. Causes digestive tract burns. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Symptoms related to the physical, chemical and toxicological characteristics:

Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

Information on toxicological effects:

Acute toxicity: Harmful if swallowed.

Skin corrosion/irritation: Causes severe skin burns and eye damage.

Serious eye damage/eye Irritation: Causes serious eye damage.

Respiratory sensitization: Not available.

Skin sensitization:	No data available.
Germ cell mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive toxicity:	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure:	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure:	No data available.
Aspiration hazard:	Not available.
Chronic effects:	Prolonged inhalation may be harmful.

Components Species Test Results:
Hydrochloric acid (CAS# 7647-01-0)

Rat - Inhalation LC_{50}:	3124 ppm, (1 hour)
Rabbit - Dermal LD_{50}:	5010 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity:	Because of the low pH of this product, it would be expected produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Aquatic Toxicity:	This material is toxic to fish and aquatic organisms. Most aquatic species do not tolerate pH lower than 5.5 for any extended period.
Fish Toxicity:	Fish LC_{50} Mosquito fish: 282 mg/l, 96 hours Fish LC_{50} Bluegill: 3.6 mg/l, 48 hours
Persistence and degradability:	Not biodegradable. Hydrochloric acid will likely be neutralized to chloride by alkalinity present in natural environment..
Bioaccumulative Potential:	No data available.
Mobility in soil:	Hydrochloric acid will be neutralized by naturally occurring alkalinity. The acid will permeate soil, dissolving some soil material and will then neutralize.
Other adverse effects:	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation

SECTION 13: DISPOSAL CONSIDERATIONS

Collect and reclaim or dispose in sealed containers at a properly licensed waste disposal site. This material , if not neutralized, must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national or international regulations.

SECTION 14:	TRANSPORT INFORMATION

Shipping:

Usual Shipping Containers:	Tank cars, bulk tankers.
Usual Shelf Life:	Indefinite (life of containers).
Storage/Transport Temperatures:	Ambient.

Suitable Storage:

Materials/Coatings:	Teflon, Tygon, Rubber, PVC and polypropylene materials.

D.O.T. Information:

Labeling:	Corrosive
D.O.T. Identification Number	UN 1789
D.O.T. Shipping Name:	Hydrochloric Acid
Hazard Class:	8
Packing Group:	II
Hazard Guide:	157
Placard:	UN 1789

SECTION 15	REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:
Hydrochloric Acid CAS#: 7647-01-0

SARA 311/312 Hazards
Acute health hazard, reactive hazard.

Massachusetts Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
Pennsylvania Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
New Jersey Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other reproductive harm.

OSHA PSM/RMP Threshold for Accidental Release:
CAS# 7647-01-0 is regulated under OSHA PSM ***only*** if anhydrous HCl.
CAS# 7647-01-0 is regulated under EPA RMP ***only*** if ≥ 37% HCl.

Toxic Substances Control Act (TSCA):
Hydrochloric Acid CAS#: 7647-01-0

Comprehensive Environmental Response Compensation Liability Act: (CERCLA)
Hydrochloric Acid CAS#: 7647-01-0

SECTION 16 OTHER INFORMATION

NFPA Rating:
Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 1

This information is drawn from recognized sources believed to be reliable. ASHTA Chemicals, Inc. Makes no guarantees or assumes any liability in connection with this information. The user should be aware of changing technology, research, regulations, and analytical procedures that may require changes herein. The above data is supplied upon the condition that persons will evaluate this information and then determine its suitability for their use. Only U.S.A regulations apply to the above.

Version 1.0	For the new GHS SDS Standard	Revision Date: 12/31/2014
Version 1.1	Graphics updated	Revision Date: 3/9/2015
Version 1.2	Title updated	Revision Date: 6/2/2015
Version 1.3	Section 9 changes	Revision Date: 7/30/2015
Version 1.4	Section 1, 15 changes	Revision Date: 4/15/2016

* * * Section 1 - PRODUCT AND COMPANY IDENTIFICATION * * *

Material Name: ISOBUTYLENE

Manufacturer Information

ADVANCED GAS TECHNOLOGIES
1401 Stauffer Road
Palm, PA 18070-0035
Mfg Contact: Outside the US: 703-572-3887 (Collect Calls Accepted)

Phone: 1-800-416-2505

Emergency # 1-800-424-9300 (CHEMTREC

Chemical Family

hydrocarbons, aliphatic

Synonyms

Mtg msds 56; 2-Methylpropene; Isobutylene; Liquified petroleum gas; 2-Methyl-1-propene; L.p.g.; gamma-Butylene; Asym-dimethyl ethylene; UN 1055; RTECS: UD0890000

* * * Section 2 - HAZARDS IDENTIFICATION * * *

EMERGENCY OVERVIEW

Color: colorless
Physical Form: liquefied gas
Odor: petroleum odor
Health Hazards: central nervous system depression, difficulty breathing
Physical Hazards: Flammable gas. May cause flash fire.

POTENTIAL HEALTH EFFECTS

Inhalation

Short Term: irritation, nausea, vomiting, headache, symptoms of drunkenness, disorientation, tingling sensation, suffocation, convulsions, coma
Long Term: no information on significant adverse effects

Skin

Short Term: burns, frostbite
Long Term: no information is available

Eye

Short Term: irritation, frostbite, blurred vision
Long Term: no information on significant adverse effects

Ingestion

Short Term: frostbite
Long Term: no information is available

* * * Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS	Component	Percent
115-11-7	Isobutylene	100.0

Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Butylene (25167-67-3).

* * * Section 4 - FIRST AID MEASURES * * *

Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

Skin

If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115 F; 41-46 C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.

Eyes

Contact with liquid: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

Ingestion

If a large amount is swallowed, get medical attention.

Note to Physicians

For inhalation, consider oxygen.

* * * Section 5 - FIRE FIGHTING MEASURES * * *

See Section 9 for Flammability Properties

NFPA Ratings: Health: 1 **Fire:** 4 **Reactivity:** 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Flammable Properties

Severe fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive above flash point.

Extinguishing Media

carbon dioxide regular dry chemical

Large fires: Flood with fine water spray.

Fire Fighting Measures

Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Stop leak if possible without personal risk. Let burn unless leak can be stopped immediately. For smaller tanks or cylinders, extinguish and isolate from other flammables. Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Evacuate if fire gets out of control or containers are directly exposed to fire. Evacuation radius: 500 meters (1/3 mile). Consider downwind evacuation if material is leaking. Stop flow of gas.

* * * Section 6 - ACCIDENTAL RELEASE MEASURES * * *

Occupational spill/release

Avoid heat, flames, sparks and other sources of ignition. Do not touch spilled material. Stop leak if possible without personal risk. Reduce vapors with water spray. Keep unnecessary people away, isolate hazard area and deny entry. Remove sources of ignition. Ventilate closed spaces before entering.

* * * Section 7 - HANDLING AND STORAGE * * *

Storage Procedures

Store and handle in accordance with all current regulations and standards. Grounding and bonding required. Subject to storage regulations: U.S. OSHA 29 CFR 1910.110. U.S. OSHA 29 CFR 1910.101. Keep separated from incompatible substances.

* * * Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Analysis

Isobutylene (115-11-7)

ACGIH: 250 ppm TWA

Ventilation

Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Eyes/Face

For the gas: Eye protection not required, but recommended. For the liquid: Wear splash resistant safety goggles. Contact lenses should not be worn. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Protective Clothing

For the gas: Protective clothing is not required. For the liquid: Wear appropriate protective, cold insulating clothing.

Glove Recommendations

Wear insulated gloves.

Respiratory Protection

Under conditions of frequent use or heavy exposure, respiratory protection may be needed.
Respiratory protection is ranked in order from minimum to maximum.
Consider warning properties before use.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

* * * Section 9 - PHYSICAL AND CHEMICAL PROPERTIES * * *

Physical State:	Gas	**Appearance:**	Not available
Color:	colorless	**Physical Form:**	liquefied gas
Odor:	petroleum odor	**Odor Threshold:**	Not available
Melting Point:	-140 °C	**Boiling Point:**	-7 °C
Flash Point:	-76 °C	**Vapor Pressure:**	3278 mmHg @ 37.7 °C
Vapor Density (air = 1):	1.9	**Specific Gravity (water = 1):**	0.5879 @ 25 °C
Water Solubility:	almost insoluble	**Auto Ignition:**	465 °C
Molecular Weight:	56.12	**Molecular Formula:**	C4-H8

Solvent Solubility

Soluble: organic solvents, alcohol, ether, sulfuric acid

* * * Section 10 - STABILITY AND REACTIVITY * * *

Chemical Stability

Stable at normal temperatures and pressure.

Conditions to Avoid

Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Containers may rupture or explode if exposed to heat.

Materials to Avoid

oxidizing materials.

Decomposition Products

oxides of carbon

Possibility of Hazardous Reactions

Will not polymerize.

* * * Section 11 - TOXICOLOGICAL INFORMATION * * *

Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

Isobutylene (115-11-7)

Inhalation LC50 Rat: 620 mg/L/4H

Acute Toxicity Level

Isobutylene (115-11-7)

Non Toxic: inhalation.

Component Carcinogenicity

Isobutylene (115-11-7)

ACGIH: A4 - Not Classifiable as a Human Carcinogen

Target Organs

Isobutylene (115-11-7)

central nervous system.

* * * Section 12 - ECOLOGICAL INFORMATION * * *

Component Analysis - Aquatic Toxicity

No LOLI ecotoxicity data are available for this product's components.

* * * Section 13 - DISPOSAL CONSIDERATIONS * * *

Disposal Methods

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001.

Component Waste Numbers

The U.S. EPA has not published waste numbers for this product's components.

* * * Section 14 - TRANSPORT INFORMATION * * *

US DOT Information

Shipping Name: Isobutylene
UN/NA #: UN1055 **Hazard Class:** 2.1
Required Label(s): 2.1

TDG Information

Shipping Name: Isobutylene
UN #: UN1055 **Hazard Class:** 2.1
Required Label(s): 2.1

* * * Section 15 - REGULATORY INFORMATION * * *

U.S. Federal Regulations

None of this products components are listed under SARA Sections 302/304 (40 CFR 355 Appendix A), SARA Section 311/312 (40 CFR 370.21), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), or require an OSHA process safety plan.

SARA 311/312

Acute Health: Yes **Chronic Health:** No **Fire:** Yes **Pressure:** Yes **Reactive:** No

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Isobutylene ([1]related to: Butylene)	115-11-7	No	Yes	No	Yes	Yes	Yes[1]

Not regulated under California Proposition 65

Component Analysis - Inventory

Component	CAS	US	CA	EU	AU	PH	JP	KR	CN	NZ
Isobutylene	115-11-7	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes

* * * Section 16 - OTHER INFORMATION * * *

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Communicty; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Farenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of LIsts™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

End of Sheet 00233334

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product identifier

Trade name	PERMANONE® 30-30
Product code (UVP)	05866587
SDS Number	102000013918
EPA Registration No.	432-1235

Relevant identified uses of the substance or mixture and uses advised against

Use	Insecticide
Restrictions on use	See product label for restrictions.

Information on manufacturer

Bayer Environmental Science
2 T.W. Alexander Drive
Research Triangle PK, NC 27709
United States

Emergency telephone no.

Emergency Telephone Number (24hr/ 7 days)	1-800-334-7577 (24 hours/day)
Product Information Telephone Number	1-800-331-2867
SDS Information or Request	SDSINFO.BCS-NA@bayer.com

SECTION 2: HAZARDS IDENTIFICATION

Classification in accordance with regulation HCS 29CFR §1910.1200
Skin irritation : Category 2
Acute toxicity (Oral, Inhalation): Category 4

Signal word: Warning

Hazard statements
Causes skin irritation.
Harmful if swallowed or if inhaled.

Precautionary statements
Wash thoroughly after handling.
Wear protective gloves.

Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
IF ON SKIN: Wash with plenty of water/soap.
Specific treatment (see supplemental first aid instructions on this label).
If skin irritation occurs: Get medical advice/ attention.
Take off contaminated clothing and wash before reuse.
IF SWALLOWED: Call a POISON CENTER/doctor/physician if you feel unwell.
Rinse mouth.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
Call a POISON CENTER/doctor/physician if you feel unwell.
Dispose of contents/container in accordance with local regulation.

Other hazards
No other hazards known.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Component Name	CAS-No.	Concentration % by weight
Permethrin	52645-53-1	30.00
Piperonyl butoxide	51-03-6	30.00
HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7	38.80

SECTION 4: FIRST AID MEASURES

Description of first aid measures

General advice When possible, have the product container or label with you when calling a poison control center or doctor or going for treatment.

Inhalation Move to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a physician or poison control center immediately.

Skin contact Take off contaminated clothing and shoes immediately. Wash off immediately with plenty of water for at least 15 minutes. Call a physician or poison control center immediately.

Eye contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a physician or poison control center immediately.

Ingestion Call a physician or poison control center immediately. Rinse out mouth and give water in small sips to drink. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Do not leave victim unattended.

Most important symptoms and effects, both acute and delayed

Symptoms	To date no symptoms are known.

Indication of any immediate medical attention and special treatment needed

Risks	Contains hydrocarbon solvents. May pose an aspiration pneumonia hazard. This product contains a pyrethroid.
Treatment	Appropriate supportive and symptomatic treatment as indicated by the patient's condition is recommended. There is no specific antidote.

SECTION 5: FIREFIGHTING MEASURES

Extinguishing media

Suitable	Carbon dioxide (CO_2), Dry chemical, Foam, Water
Unsuitable	None known.
Special hazards arising from the substance or mixture	Dangerous gases are evolved in the event of a fire.

Advice for firefighters

Special protective equipment for fire-fighters	Firefighters should wear NIOSH approved self-contained breathing apparatus and full protective clothing.
Further information	Keep out of smoke. Fight fire from upwind position. Cool closed containers exposed to fire with water spray. Do not allow run-off from fire fighting to enter drains or water courses.
Flash point	129.5 °C
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Explosivity	not applicable

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Precautions	Keep unauthorized people away. Isolate hazard area. Avoid contact with spilled product or contaminated surfaces.

Methods and materials for containment and cleaning up

Methods for cleaning up	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Collect and transfer the product into a properly labelled and tightly closed container. Clean contaminated floors and objects thoroughly, observing environmental regulations.
Additional advice	Use personal protective equipment. Do not allow to enter soil,

waterways or waste water canal.

Reference to other sections Information regarding safe handling, see section 7.
Information regarding personal protective equipment, see section 8.
Information regarding waste disposal, see section 13.

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Use only in area provided with appropriate exhaust ventilation. Handle and open container in a manner as to prevent spillage.

Advice on protection against fire and explosion Keep away from heat and sources of ignition.

Hygiene measures Wash hands thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, using the toilet or applying cosmetics.
Remove Personal Protective Equipment (PPE) immediately after handling this product. Before removing gloves clean them with soap and water. Remove soiled clothing immediately and clean thoroughly before using again. Wash thoroughly and put on clean clothing.

Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers Store in a cool, dry place and in such a manner as to prevent cross contamination with other crop protection products, fertilizers, food, and feed. Store in original container and out of the reach of children, preferably in a locked storage area.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Components	CAS-No.	Control parameters	Update	Basis
Permethrin	52645-53-1	5 mg/m3 (TWA)	03 2014	ACGIH
Permethrin	52645-53-1	5 mg/m3 (REL)	2010	NIOSH
Permethrin	52645-53-1	5 mg/m3 (PEL)	02 2006	OSHA Z1
Permethrin	52645-53-1	5 mg/m3 (TWA)	1989	OSHA Z1A
Permethrin	52645-53-1	5 mg/m3 (TWA)	06 2008	TN OEL
Permethrin (Particulate.)	52645-53-1	50ug/m3 (ST ESL)	02 2013	TX ESL
Permethrin (Particulate.)	52645-53-1	5ug/m3 (AN ESL)	02 2013	TX ESL

Permethrin	52645-53-1	5 mg/m3 (TWA PEL)	09 2013	US CA OEL
Permethrin	52645-53-1	10 mg/m3 (TWA)		OES BCS*
Piperonyl butoxide	51-03-6	500 ppm (TWA)		OES BCS*
HYDROTREATED MIDDLE DISTILLATES (PETROLEUM) (Inhalable fraction.)	64742-46-7	5 mg/m3 (TWA)	03 2014	ACGIH
HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7	3500ug/m3 (ST ESL)	02 2013	TX ESL
HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7	350ug/m3 (AN ESL)	02 2013	TX ESL

*OES BCS: Internal Bayer CropScience "Occupational Exposure Standard"

Exposure controls

Personal protective equipment
In normal use and handling conditions please refer to the label and/or leaflet. In all other cases the following recommendations would apply.

Respiratory protection When respirators are required, select NIOSH approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industry recommendations.

Hand protection Chemical resistant nitrile rubber gloves

Eye protection Safety glasses with side-shields

Skin and body protection Wear long-sleeved shirt and long pants and shoes plus socks.

General protective measures Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and warm/tepid water.
Keep and wash PPE separately from other laundry.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance beige to brown

Physical State Liquid

Odor characteristic

Odour Threshold no data available

pH no data available

Vapor Pressure no data available

Vapor Density (Air = 1)	no data available
Density	ca. 0.99 g/cm³ at 20 °C
Bulk density	8.25 lb/gal
Evapouration rate	no data available
Boiling Point	no data available
Melting / Freezing Point	no data available
Water solubility	non-emulsifiable
Minimum Ignition Energy	not applicable
Decomposition temperature	no data available
Partition coefficient: n-octanol/water	not applicable
Viscosity	47 mPa.s at 20 °C
Flash point	129.5 °C
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Explosivity	not applicable

SECTION 10: STABILITY AND REACTIVITY

Reactivity	
Thermal decomposition	no data available
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	no data available
Incompatible materials	Strong oxidizing agents
Hazardous decomposition products	No decomposition products expected under normal conditions of use.

SECTION 11: TOXICOLOGICAL INFORMATION

Exposure routes	Eye contact, Skin contact, Ingestion, Inhalation
Immediate Effects	

Eye	Moderate eye irritation.
Skin	Causes skin irritation. Harmful if absorbed through skin.
Ingestion	Harmful if swallowed.
Inhalation	May be harmful if inhaled.

Information on toxicological effects

Acute oral toxicity	LD50 (male/female combined rat) 993 mg/kg
Acute inhalation toxicity	LC50 (rat) > 2.2 mg/l Exposure time: 4 h Determined in the form of liquid aerosol.
	LC50 (rat) > 8.8 mg/l Exposure time: 1 h Determined in the form of liquid aerosol. Extrapolated from the 4 hr LC50.
Acute dermal toxicity	LD50 (rat) > 2,000 mg/kg
Skin irritation	Moderate skin irritation. (rabbit)
Eye irritation	Mild eye irritation. (rabbit)
Sensitisation	Non-sensitizing. (guinea pig)

Assessment repeated dose toxicity

Permethrin did not cause specific target organ toxicity in experimental animal studies.
Piperonyl butoxide did not cause specific target organ toxicity in experimental animal studies.

Assessment Mutagenicity

Permethrin was not mutagenic or genotoxic in a battery of in vitro and in vivo tests.
Piperonyl butoxide was not mutagenic or genotoxic in a battery of in vitro and in vivo tests.

Assessment Carcinogenicity

Permethrin caused at high dose levels an increased incidence of tumours in mice in the following organ(s): liver, Lungs. The mechanism that triggers tumours in rodents is not relevant for the low exposures encountered under normal use conditions.
Piperonyl butoxide was not carcinogenic in lifetime feeding studies in rats and mice.

ACGIH

HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7	Group A4

NTP

HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7	1980

IARC

Permethrin	52645-53-1	Overall evaluation: 3
Piperonyl butoxide	51-03-6	Overall evaluation: 3
HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7	Overall evaluation: 3
HYDROTREATED MIDDLE DISTILLATES	64742-46-7	Overall evaluation: 1

(PETROLEUM)

OSHA

None.

Assessment toxicity to reproduction

Permethrin did not cause reproductive toxicity in a two-generation study in rats.
Piperonyl butoxide did not cause reproductive toxicity in a two-generation study in rats.

Assessment developmental toxicity

Permethrin did not cause developmental toxicity in rats and rabbits.
Piperonyl butoxide did not cause developmental toxicity in rats and rabbits.

Further information

Only acute toxicity studies have been performed on the formulated product.
The non-acute information pertains to the active ingredient(s).

SECTION 12: ECOLOGICAL INFORMATION

Toxicity to fish	LC50 (Poecilia reticulata (guppy)) 0.0076 mg/l Exposure time: 96 h The value mentioned relates to the active ingredient permethrin.
	LC50 (Cyprinodon variegatus (sheepshead minnow)) 3.94 mg/l Exposure time: 96 h The value mentioned relates to the active ingredient piperonyl butoxide.
Toxicity to aquatic invertebrates	EC50 (Daphnia magna (Water flea)) 0.00017 mg/l Exposure time: 48 h The value mentioned relates to the active ingredient permethrin.
	EC50 (Daphnia magna (Water flea)) 0.51 mg/l Exposure time: 48 h The value mentioned relates to the active ingredient piperonyl butoxide.
Toxicity to aquatic plants	EC50 (Algae) 0.5 mg/l Exposure time: 72 h The value mentioned relates to the active ingredient permethrin.
	EC50 (Algae) > 9.1 mg/l Exposure time: 72 h The value mentioned relates to the active ingredient piperonyl butoxide.
Biodegradability	Permethrin: ; not rapidly biodegradable Piperonyl butoxide: ; not rapidly biodegradable
Koc	Permethrin: Koc: 100000 Piperonyl butoxide: Koc: 399 - 830
Bioaccumulation	Permethrin: Bioconcentration factor (BCF) 300; Does not

	bioaccumulate. Piperonyl butoxide: ; Potential bioaccumulation
Mobility in soil	Permethrin: Immobile in soil Piperonyl butoxide: Moderately mobile in soils
Environmental precautions	Do not apply when weather conditions favor runoff or drift. Drift and runoff from treated areas may be hazardous to aquatic organisms in adjacent sites. Do not allow to get into surface water, drains and ground water. Do not contaminate surface or ground water by cleaning equipment or disposal of wastes, including equipment wash water. Apply this product as specified on the label. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Product	Pesticide, spray mixture or rinse water that cannot be used according to label instructions may be disposed of on site or at an approved waste disposal facility.
Contaminated packaging	Triple rinse containers. Puncture container to avoid re-use. Dispose of empty container in a sanitary landfill or by incineration, or, if allowed by State/Provincial and local authorities, by burning. If burned, stay out of smoke. Follow advice on product label and/or leaflet.
RCRA Information	Characterization and proper disposal of this material as a special or hazardous waste is dependent upon Federal, State and local laws and are the user's responsibility. RCRA classification may apply. When and if this material is determined to be a waste, if discarded, this material may carry RCRA waste code(s) **NON-RCRA**. State and local laws may vary and must be considered.

SECTION 14: TRANSPORT INFORMATION

49CFR	Not dangerous goods / not hazardous material

IMDG

UN number	**3082**
Class	9
Packaging group	III
Marine pollutant	YES
Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (PERMETHRIN, PIPERONYL BUTOXIDE SOLUTION)

IATA

UN number	**3082**
Class	9
Packaging group	III
Environm. Hazardous Mark	YES
Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (PERMETHRIN, PIPERONYL BUTOXIDE SOLUTION)

This transportation information is not intended to convey all specific regulatory information relating to this product. It does not address regulatory variations due to package size or special transportation requirements.

Freight Classification: INSECTICIDES OR FUNGICIDES, N.O.I., OTHER THAN POISON

SECTION 15: REGULATORY INFORMATION

EPA Registration No. 432-1235

US Federal Regulations

TSCA list

Piperonyl butoxide	51-03-6
HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7

US. Toxic Substances Control Act (TSCA) Section 12(b) Export Notification (40 CFR 707, Subpt D)
None.

SARA Title III - Section 302 - Notification and Information
None.

SARA Title III - Section 313 - Toxic Chemical Release Reporting

Permethrin	52645-53-1	1.0%
Piperonyl butoxide	51-03-6	1.0%

US States Regulatory Reporting

CA Prop65
This product does not contain any substances known to the State of California to cause cancer.

This product does not contain any substances known to the State of California to cause reproductive harm.

US State Right-To-Know Ingredients

Permethrin	52645-53-1	NJ, RI
Piperonyl butoxide	51-03-6	NJ, RI
HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7	CA

Canadian Regulations

Canadian Domestic Substance List

HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7

Environmental
CERCLA
None.
Clean Water Section 307 Priority Pollutants
None.
Safe Drinking Water Act Maximum Contaminant Levels

Permethrin	52645-53-1

International Regulations
European Inventory of Existing Commercial Substances (EINECS)

Permethrin	52645-53-1
HYDROTREATED MIDDLE DISTILLATES (PETROLEUM)	64742-46-7

EPA/FIFRA Information:
This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information required on the pesticide label:

Signal word: Caution!

Hazard statements: Harmful if swallowed or absorbed through skin.
Moderate eye irritation.
Avoid contact with skin, eyes and clothing.

SECTION 16: OTHER INFORMATION

NFPA 704 (National Fire Protection Association):

Health - 2	Flammability - 1	Instability - 0	Others - none

HMIS (Hazardous Materials Identification System, based on the Third Edition Ratings Guide)

Health - 1	Flammability - 1	Physical Hazard - 0	PPE -

0 = minimal hazard, 1 = slight hazard, 2 = moderate hazard, 3 = severe hazard, 4 = extreme hazard

Reason for Revision: Revised according to the current OSHA Hazard Communication Standard (29CFR1910.1200)

Revision Date: 02/09/2015

AECOM

Attachment H

Work Plan/Client SH&E Requirements

Attachment H: Work Plan/Client SH&E Requirements

SITE SPECIFIC HEALTH AND SAFETY PLAN

Aecom, 33 Fulton St., Duso Site, Poughkeepsie, NY

Date:
Monday November 1, 2021

DPT Drilling

Prepared For:
Aecom
40 British American Blvd.
Latham, NY 12110

Prepared By:
CASCADE
2846 Curry Rd..
Schenectady, NY 12303

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Tables

Appendices

1 PROJECT SPECIFIC INFORMATION

This Site-Specific Health and Safety Plan (HASP) supplements CASCADE Drilling's Injury and Illness Prevention Program, the Client's HASP prepared for the Site, applicable Job Safety Analysis (JSA) and Safety Data Sheets (SDS). This HASP describes the work to be performed by CASCADE personnel and addresses health and safety concerns with respect to proposed field activities, as well as personal protection requirements and safe working practices, monitoring and site control procedures, and contingency plans for emergency situations.

1.1 Client

This Health and Safety Plan was prepared for Aecom.

1.2 Site Address

The Site is located at:

33 Fulton St., Poughkeepsie, NY 12601

1.3 Contaminants of Concern

The following possible COCs have been identified and/or are suspected to be present on the Site:

BTEX (Benzene, Toluene, Ethylbenzene, and Xylene):

BTEX Is a group of chemical compounds (benzene, toluene, ethylbenzene, and xylenes) found mainly in petroleum products. These chemical compounds are often identified by a familiar characteristic odor. Short-term exposure to gasoline and its components (BTEX) has been associated with skin and sensory irritation, central nervous system problems (tiredness, dizziness, headache, loss of coordination) and effects on the respiratory system. Prolonged exposure to BTEX compounds can affect the kidney, liver and blood systems. The PID or flame ionization detector (FID) used for field monitoring has reduced sensitivity (response factor) for such hydrocarbons. Detector tubes, halide monitors, or other methods may be used for detection. Sensing of the characteristic odor indicates the need to upgrade respiratory protection and to initiate personnel monitoring.

Chlorinated Solvents:
Chlorinated solvents have been widely used at industrial and military sites in large quantities and may exist in free-product layers at some sites. Chlorinated solvents present a wide range of toxic modalities, with certain compounds being highly toxic and others being essentially inert. Chlorinated solvents are often identified by a familiar characteristic odor. The PID or flame ionization detector (FID) used for field monitoring has reduced sensitivity (response factor) for some chlorinated hydrocarbons. Detector tubes, halide monitors, or other methods may be used for detection. Sensing of the characteristic odor indicates the need to upgrade respiratory protection and to initiate personnel monitoring.

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA, PFOS, GenX, and many other chemicals. PFAS have been manufactured and used in a variety of industries around the globe, including in the United States since the 1940s. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body – meaning they don't break down and they can accumulate over time. There is evidence that exposure to PFAS can lead to adverse human health effects. Studies indicate that PFOA and PFOS can cause reproductive and developmental, liver and kidney, and immunological effects in laboratory animals. Both chemicals have caused tumors in animals. The most consistent findings are increased cholesterol levels among exposed populations, with more limited findings related to low infant birth weights, effects on the immune system, cancer (for PFOA), and thyroid hormone disruption (for PFOS).

1.4 Scope of Work

Cascade's scope of work includes sampling using a DPT drill rig. The following design elements are built into the cost estimate:

- Direct-push soil sampling up to 40' below grade and preclearing the locations using soft dig techniques.

1.5 Responsible Personnel

CASCADE and Client personnel responsible for field activities at the Site are identified in Table 1.

Table 1 – Responsible Personnel for the Site

Title/Responsibilities	Name	Office	Cell Phone
Client Project Manager (PM)	Lindsay Mitchell	518-951-2372	845-430-7589
CASCADE Project Manager (PM)	Ethan Plank	518-355-2201	518-265-7471
CASCADE EHS Personnel	Ken Post	N/A	425-457-3297
Notes: 1 – If information is not available prior to mobilization to the site, complete on-site prior to starting work.			

1.6 Emergency Contact Information

Project emergency contact information and phone numbers are identified in Table 2.

Table 2 – Emergency Contact Information

Agency	Address	Phone Number
Emergency Medical Facility	MidHudson Regional Hospital	845-483-5000
Non-Emergency Hotline	WorkCare Incident Intervention	888-449-7787
Medical, Fire, or Police	Routed to nearest provider via 911	911
Site Specific Emergency Contact	NA	NA
Notes: 1 – If information is not available prior to mobilization, complete on-site prior to starting work.		

2 STOP WORK AUTHORITY (SWA)

SWA establishes the responsibility and authority of any individual to stop work when an unsafe condition or act is observed in order to take prompt corrective action.

3 SITE DESCRIPTION

The Site address and information provided by the Client regarding contaminants of concern (COCs) that have been identified and/or suspected to be present at the Site are described under Site/Project Specific Information. Chemical monitoring for site specific contaminants of concern will be conducted by the Client in accordance with the Client's HASP.

4 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

The following the roles and responsibilities of onsite CASCADE and Client personnel for field activities at this Site.

Client Project Manager (PM)

Responsible for managing the overall project and communicating with regulatory agency staff, responsible party (RP), and property owners and tenants.

Client On-Site Representative

Responsible for implementing the work plan for the Site enforcing the Client's HASP and communicating with Client PM, regulatory agency staff, and property owners and tenants.

CASCADE Project Manager (PM)

Responsible for managing the project and oversight of field activities.

CASCADE Site Supervisor

Responsible for leading the field team and implementing the SOW and HASP.

CASCADE Environmental Health and Safety (EHS) Department

Responsible for CASCADE's health and safety and oversight of CASCADE field activities.

5 SITE CONTROL

Work conducted at the Site will have a site control program established appropriate to the proposed field activities to be conducted and the associated hazards identified.

For intrusive field activities (i.e. drilling or chemical reagent injection), precautions shall be taken to ensure that only authorized personnel with the proper training and personal protective equipment (PPE) enter work areas associated with the operation of heavy equipment and/or the potential for exposure to hazardous conditions/materials (Exclusion Zone). In these areas, access is controlled with caution tape, signs, traffic cones, and/or barricades. Personnel and equipment in the Exclusion Zone will be kept to the smallest number consistent with effective site operations.

At CASCADE's SSO discretion, a three zone controlled area system may be established including:

- Exclusion Zone (contaminated area) – defined as the area on site where contamination is suspected and/or where drilling, reagent mixing and/or reagent injection will take place.
- Contamination Reduction Zone (decontamination area) – defined as the area where personnel and equipment are to be decontaminated.
- Support Zone – defined as the command area and may serve as a staging and storage area for supplies and material storage and handling.

6 HAZARD ASSESSMENT

Hazards identified during the job-hazard analysis include chemical reagent injection materials, physical, chemical, and biological hazards. These hazards are discussed in the following sections.

6.1 CHEMICAL HAZARDS

If applicable, chemicals and/or remediation compounds brought into the field by CASCADE, the Client, or activity support personnel may include the following hazards:

- possible oxygen deficiency if used in areas with poor ventilation;
- chemical burns or irritations;
- toxic exposures; and
- fires/explosions.

The CASCADE PM will evaluate the need for special chemical-handling procedures during the chemical-use review process. A summary of the potential hazards associated with the chemical reagents present at the Site are presented in the Site/Project Specific Information at the beginning of this HASP.

6.2 PHYSICAL HAZARDS

Activities at this Site may expose personnel to various physical and/or industrial hazards. The CASCADE SSO or designee will observe all operations, particularly drill rig and reagent mixing and injection operations, to oversee safety hazards such as pinch-points (areas on drill rigs or heavy equipment where limbs or extremities may become caught, mutilated, or dismembered).

To prevent injuries, engineering controls, administrative procedures (e.g., lockout-tagout procedures), and equipment-guarding techniques will be implemented. In addition, proper PPE will be used when engineering controls alone cannot reduce the risk of exposure to hazards to acceptable limits. The following section presents a summary of the industrial hazards expected and general methods that will be utilized by CASCADE personnel to ensure personnel safety.

General Physical Hazards

The Site may include ditches, areas that are poorly drained, rough or uneven terrain, depressed areas (that may present oxygen deficiency or flammable gas collection areas), protruding objects, and impalement hazards. The CASCADE SSO will ensure that a careful pre-work walkover is made of all work areas and potential access or egress routes. Unsafe areas may be flagged or taped by the CASCADE SSO and will be identified to all personnel.

Energized and Rotating Equipment

In all cases, heavy equipment with rotating shafts or gears will be guarded to prevent accidental contact. Only experienced CASCADE personnel are allowed to work around rotating parts that cannot be adequately guarded. Personnel who must work around rotating equipment will not wear loose-fitting clothes that could get caught. Special precautions should be observed during drilling operations involving casing removal to avoid potential accidents due to equipment failure or breakage.

CASCADE personnel will maintain and implement safety procedures according to this HASP. Only trained and qualified CASCADE personnel will operate heavy equipment during field activities. All appropriate safety devices on all machinery and rotating equipment (e.g., backup alarms, emergency stops, and guards) will be maintained and operational at all times.

Falling, Slipping, and Tripping

Work zone surfaces will be maintained in a neat and orderly state. Foot traffic will avoid areas where materials are stored on the ground. Tools and materials will not be left randomly on surfaces when not in direct use. The CASCADE Site Supervisor and/or SSO will ensure that work area are maintained in a neat and orderly state. Hoses and cables (if used) will be grouped, routed to minimize hazards, and covered with a ramp or bridge or clearly marked with hazard tape or flags.

High-Pressure Hoses

High-pressure hose ends may whip if the fitting becomes disconnected. All hose ends will be secured to minimize whipping, and connections should be secured to prevent accidental disconnects. Appropriately rated whip chains and/or straps will be used at connection points where the potential for accidental disconnect is present.

Lifting/Twisting Injuries

Use of hand augers subjects personnel to forces which could cause back, shoulder or neck injury. Common-sense safety precautions will be followed such as frequent rest breaks, proper lifting technique and careful ergonomic practices.

Manual Lifting Techniques

During any manual material-handling tasks, personnel will lift with the force of the load suspended on their legs and not on their backs. An adequate number of personnel or an appropriate mechanical device must be used to safely lift or handle heavy equipment or materials. When heavy objects must be lifted manually, personnel will keep the load close to the body and will avoid any twisting or turning motions to minimize stress on the lower back. The CASCADE SSO can provide a lifting orientation and specific back stretching and warm-up exercises to help minimize the potential for back injuries. Use of these exercises by all field personnel at the start of each shift will be encouraged by the CASCADE SSO.

Noise

Working near a drill rig, near operating injection pumps, or a number of other Site activities, can subject personnel to noise exposures in excess of allowable limits. Non-essential personnel who do not need to be next to loud equipment should stay as far away as possible to lower the risk of noise-induced hearing loss. Personnel who operate or must work next to drill rigs or operating injection pumps and/or generators will be required to wear hearing protection (ear plugs or muffs) to reduce their exposure to excessive noise. Persons who enter areas in excess of 85 decibels (dB) will be required to wear hearing protection.

Roadway Work

Work on the shoulder or high traffic areas (i.e. parking lots) will subject workers to heavy vehicular traffic, some moving at high speeds. CASCADE personnel will maintain high awareness of traffic condition during work location mobilization and during subsequent activity. Whenever possible, work will be conducted behind barriers such as work vehicles or Jersey barriers which will themselves be marked by early warning signs such as cones, lighted signs or flagmen. At a minimum CASCADE personnel will setup traffic control using cones, signs, and/or warning tape and will wear Class 2 reflective vests during daytime hours and Class 3 reflective vests during night-time hours.

Work Near Roadways

Traffic control will be implemented in accordance with installation requirements. Employees performing traffic control will wear orange garments in the daytime and reflectorized garments after dusk. Work near roadways will be halted during periods of heavy rainfall.

Sampling: Soil, Groundwater, and Soil-Gas

Sampling of contaminated soil, groundwater, and/or soil-gas presents multiple hazards to CASCADE personnel including chemical exposure, fire and explosion hazards, and hazards from contacting unidentified energized utilities. The CASCADE Site Supervisor and SSO will ensure that personnel are aware of the Site COCs and that proper PPE is available and properly worn.

Shift Work (Night Work)

Shift work (especially nightshifts) can disrupt our daily cycle of activities and body clock. Humans can usually adapt to temporary changes but after a while a build-up of lost sleep causes fatigue which can affect our performance of day to day tasks. Control measures may include identifying suitable sleep schedule that works for you, ensure that conditions at home are adequate so that you can get sufficient sleep before your shift, keep the light bright in your work area, notify a supervisor immediate if you are tired or drowsy.

Solar Radiation

The CASCADE SSO will encourage personnel working or visiting the Site to utilize covering or sunblock preparations to minimize the harmful effects of the sun's rays on the skin.

Steam-Cleaning Equipment

Eye and face protection will be used by steam cleaner operators. Only qualified personnel trained in the safe operation and maintenance of steam cleaners will be authorized to use them. Subcontractors operating such equipment will include safety precautions in their code of safe practices.

Underground Utilities

Because buried underground cables may be present at this site. An underground utility check will be performed before drilling. In addition, where records are inadequate or questionable, a utility search using specialized cable-detection equipment may be performed at the Client's discretion. Penetration of the surface will only be performed at boring location previously marked in white paint by the Client's On-site Representative. At the clients request boring locations may be cleared using an air-knife or similar equipment/methods. At locations not previously cleared using air-knife (or similar equipment/methods), boring location may be cleared with a hand auger at the Client's request.

Overhead and buried pipelines containing natural gas and petroleum fuels are common on industrial sites and military installations. These pipelines present another source of a potential fire and explosion hazard. All work areas will be cleared by the CASCADE SSO or designated safety coordinator prior to soil-intrusive work or movement of heavy equipment into or through utility corridors. In addition, when locations of buried lines are uncertain, excavation will always be performed by hand until the utility is located or the area is cleared. The responsible installation operations or maintenance department will review the location of emergency shutoff valves with project personnel at the pre-job meeting or tool box safety meeting prior to working in an area of concern.

The CASCADE SSO will confirm with the Client On-site Representative that proper notification to the State's "One Call" notification center was made and a valid ticket number issued. "One Call" center Member agency markings will be verified at the Site before penetrating the surface with heavy equipment.

Vehicle and Heavy Equipment Operation

Vehicles will only be operated in authorized areas. When moving equipment, caution should be exercised in order not to damage equipment or cause injury. When backing up heavy vehicles (larger than pickup trucks), passenger vehicles, or pickups with obscured rear vision, a guide will be used to direct the vehicle. Extra caution will be exercised during vehicle operation on dike roads, industrial areas, and other close spaces.

Personnel directing traffic will wear appropriate reflective vests. Each vehicle will be equipped with a minimum of one portable dry-chemical fire extinguisher rated A/B/C.

6.3 Biological Hazards

The CASCADE SSO will screen the area for biological hazards during the initial site visit and will discuss any problems with installation personnel during the pre-work review. Multiple biological hazards may be present at the site. The most common hazards anticipated are discussed below.

Insects

Bees, wasps, yellow jackets, black widow spiders, scorpions, and brown recluse spiders present a potential hazard on this project, especially so for those individuals sensitized to those bites or stings. Prior to initial assignment on this project, personnel with known allergic responses to insect stings will be identified and field supervisors made aware of this condition. These personnel will also carry an antidote kit if so advised by their physician. The CASCADE SSO will confirm that the antidote kit is accessible and notify the emergency medical service providers in the event of any incident.

In all cases, a victim suspected of being bitten by either a black widow or brown recluse spider, or stung by a scorpion will receive medical attention. The venom from the brown recluse spider is capable of causing coma and kidney failure in its victim. Protection methods against insects may be employed, such as the use of protective clothing or insect repellents, as well as extermination measures, and training in recognition and identification of harmful insects.

Feces (Animal)

Bird and rodent feces are commonly encountered within abandoned structures, sometimes in significant amounts. Rodent-borne disease which can be contracted from exposure to this contamination includes hantavirus, which results in severe respiratory distress, plague, and sometimes death. Rodent feces should be decontaminated with a 10% hypochlorite (bleach) solution and removed via wet methods (preferably) or with a HEPA equipped vacuum system and respiratory protection. Workers should be advised of the hazard and risks of the work. Workers should be further advised that if a fever or respiratory illness develops within 45 days of the potential exposure, they should seek medical attention and inform the physician of potential hantavirus exposure.

Poisonous Plants

Poisonous plants may be present at the site. Poison ivy, poison oak, and poison sumac are identified by three leaves or five leaves emanating from a stem. The plants contain a resin that causes a delayed allergic hypersensitivity reaction on contact. The resin is active in live, dead, dry, and burned plant parts; and it may be carried through the air. Signs and symptoms are usually evident within 24 to 48 hours after exposure. These include burning, stinging, and blisters. Notify the CASCADE SSO if these plants are observed. If exposure or contact occurs, wash the affected area, but do not spread the resin to unexposed areas.

Rattlesnakes

Personnel should be extremely careful when walking through tall grass, rocks, or debris. If a rattlesnake is encountered, slowly and quietly back away from the snake. Inform all personnel at the site of its location. Do not attempt to move or kill a snake because certain species of rattlesnake are protected under state and federal laws. In the event of a snakebite, immediately summon emergency medical services and notify the CASCADE SSO. Do not try to move the affected limb; instead, immobilize the injured area, keeping it lower than the heart if possible, and wait for transportation. Do not apply ice, do not cut the wound, and do not apply a tourniquet. The venom should be wiped off the skin since venom will attack intact skin. If you know the victim cannot receive medical care within 30 minutes, consider suctioning the wound using a snakebite kit.

Ticks

Ticks transmit many diverse etiologic agents. Diseases transmitted by tick include Lyme disease, Rocky Mountain spotted fever, and other viral and rickettsial diseases.

Lyme disease is a spirochete-type bacterial infection that is transmitted to humans and some animals by two species of tick. The deer tick is probably the more prevalent. The female is approximately 1/4 inch long and black and red in color. Symptoms of Lyme disease include chills, fever, headache, fatigue, stiff neck, and bone ache. Lyme disease presents itself as a rash with a small welt in the center.

Symptoms of Rocky Mountain spotted fever include chills, fever, headache, fatigue, stiff neck, and bone ache. Spotted fever presents itself as red spots under the skin.

Ticks are normally found in wooded and bushy areas. When walking through tall brush areas, periodically check yourself and your coworkers for presence of any ticks. Because ticks burrow into the skin. It is essential to remove the entire tick as soon as it is found. If the head cannot be removed, medical treatment should be obtained. Should severe signs of infection or fever develop, the patient should seek prompt medical care.

Vermin

Rats, mice, squirrels, and rabbits are carriers of disease. Where vermin are identified in work areas, the CASCADE SSO will be immediately notified. Bites will be immediately reported and medical care obtained.

Infections associated with rodent-borne disease are present in the southwestern United States. Infections may occur in humans associated with activities that bring humans into contact with rodents, rodent saliva, or rodent excreta. Activities that may bring humans into contact with the etiologic agents causing infection include the following situations:

- working in areas of field crops;
- occupying previously vacant cabins, buildings, or outhouses;
- cleaning outbuildings;
- disturbing rodent-infested areas;
- visiting areas where rodent populations have increased; and
- entering crawl spaces or other potential rodent-infested areas.

Transmission of disease may occur through broken skin, contact with conjunctivae, ingestion of contaminated food or water, or inhalation of aerosols. Prevention is through environmental hygiene practices that deter rodents from colonizing the work environment.

Cleanup of rodent-contaminated areas or areas meeting the above criteria will be performed wearing Level C protective equipment, including full-face respirator and head covering. Vacuuming or dry sweeping should not be used since this may generate aerosols. Surfaces should be disinfected by spraying with a detergent, water, and disinfectant mixture. Reusable protective clothing will be decontaminated and disinfected daily. Where rodent infestation is positively identified, all waste will be disposed in double-bagged containers and will be marked as infectious.

7 HAZARD MONITORING

During field activities, any potentially toxic air contaminants and/or explosive gas mixtures shall be monitored.

7.1 Site-Specific Chemical Monitoring

Chemical monitoring for site-specific contaminants of concern will be conducted by the Client On-site Representative in accordance with the Client's site-specific HASP.

7.2 CASCADE-Specific Operations Chemical Monitoring

Chemical monitoring for toxic air contaminants and/or explosive gas mixtures associated with CASCADE drilling and chemical reagent injection activities, if applicable will be monitored by qualified and trained personnel (if required). During active chemical reagent injection activities, monitoring will be conducted both in the chemical reagent mixing area and at the injection point. Hazard monitoring if required will be conducted in accordance with guidelines specified in Table 3.

Table 3 – Hazard Monitoring

Task	Hazard	Instrument	Group Responsible
Site Specific Chemical Monitoring			
Drilling, Fracturing, Injection, and well installation activities	Organic Vapor	PID/FID	Client Personnel
	Combustible Gas	Explosimeter/ Combustible Gas Indicator	Client Personnel
CASCADE–Specific Operations Monitoring			
Drilling, Fracturing, Well Installation and Injection Activities	Noise*	No instrument – auditory	SSO
	Dust/Particulate	No instrument – visual	SSO
	H2S	Hydrogen Sulfide Meter	SSO
	CO/CO2	Multi-Gas Detector	SSO
	Pressures	Pressure Gauges	SSO/Operators
Reagent/Fracturing Material Mixing	Noise*	No instrument – auditory	SSO
	Dust/Particulate	No instrument – visual	SSO

Notes:
* Monitoring for hazardous noise levels required prior to downgrading PPE. If monitoring is not conducted appropriate hearing protection must be worn during drilling operations and during injection activities if noise levels exceed 50 decibels (if normal conversation is difficult to hear).
CO – Carbon monoxide (Multi-gas detector with CO sensor)
CO2 – Carbon dioxide (Multi-gas detector with CO2 sensor)
PID – Photoionization detector
FID – Flame ionization detector

Personnel monitoring will be initiated if the action levels listed in Table 4 are equaled or exceeded and/or personnel are required to work using respiratory protection for periods exceeding one hour.

Table 4 – Monitoring Methods and Action Levels

Hazard	Screening Method	Action Level	Action Required
Organic Vapor (Benzene Suspected)	PID/FID	0 to 1 ppm above background	No action
		Greater than 1 ppm	Level C Protection APR w/ OV Cartridge
		Greater than 50 ppm	Stop Work
Organic Vapor (Benzene Absent)	PID/FID	0 to 25 ppm above background	No action
		Greater than 25 ppm	Level C Protection APR/Full or Half w/ OV Cartridge
		Greater than 200 ppm	Stop Work
Hydrogen Sulfide	Hydrogen Sulfide Meter	1 to 5 ppm STEL	Continuous Monitoring
		Greater than 5 ppm	Level C Protection APR/Full-face Acid Gas Cartridge
		Greater than 10 ppm	Stop Work
Combustible Gas	Explosimeter/ Combustible Gas Indicator	Less than 10% LEL	No Action
		10% to 20% LEL	Continuous Monitoring Non-sparking Tools Only
		Greater than 20% LEL	Stop Work
Oxygen Concentration	Oxygen Analyzer	Less than 20	Leave area Evaluate Cause
		20% to 23%	Normal Range
		Greater than 23% LEL	Investigate Cause Stop All Spark Inducing Activity
Dust	Mini-RAM	Greater than 50 ug/m^3	Respiratory Protection N95 Dust Mask P100 Particulate Respirator/Cartridge
Carbon Monoxide (CO)	Carbon Monoxide Detector or Multi-Gas Detector with CO Sensor	0 to 35 ppm	No Action
		Greater than 35 ppm	Ventilation/Exhaust Controls Continuous Monitoring
		Greater than 100 ppm	Stop Work
Carbon Dioxide (CO2)	Carbon Dioxide Detector or Multi-Gas Detector with CO2 Sensor	0 to 1,000 ppm	No Action
		Greater than 5,000 ppm	Ventilation/Exhaust Controls Continuous Monitoring
		Greater than 10,000 ppm	Stop Work

Notes:
APR – air purifying respirator
LEL – lower explosive limit
OV – organic vapor
PPM – parts per million
STEL – short-term exposure limit
CO – carbon monoxide
CO2 – carbon dioxide

8 HEAT ILLNESS PREVENTION

Altitude, geographic location, season and PPE may increase the potential for CASCADE personnel working outdoors to experience heat illness. CASCADE personnel shall have sufficient drinking water on-site during field activities (minimum of 4 quarts per person, when access to drinking water is limited). Whenever possible CASCADE personnel will take breaks in cool shaded areas. Access to shade or a vehicle with working air conditioner will be available for all personnel when any person believes they need a preventative recovery period.

Table 5 – Action Levels for Heat Stress

Type of Measurement	Action Level	Action
Ear Insertable Core Temperature	100.4 Degrees Fahrenheit or Greater	Remove from Work
Ear Insertable Core Temperature	Less than 99 Degrees Fahrenheit	Return to Work

9 PERSONAL PROTECTIVE EQUIPMENT

The anticipated level of Personal Protective Equipment (PPE) for most of the field activities at the Site will be Level D and modified Level D. Modified Level D will be required if splashes from chemicals, reagents, or direct contact with contaminated groundwater are likely during field activities. Level C PPE will be required when the levels of contaminants exceed the action levels listed in Table 2 or if/when chemical reagents can become airborne (exposure to particulate) or produce secondary gases and/or vapor.

Minimum Level D PPE Includes:

- Hard hat;
- safety glasses;
- appropriate work gloves; and
- normal work clothes (CASCADE uniform)

In additional to the minimum level D PPE listed above additional PPE may be required based on the scope of work and the specific chemicals/reagent materials being handled. Table 6 presents a list of additional PPE requirements for chemical/material handling (refer to chemical-specific JSA for detailed information).

9.1 Reflective Vest Requirements

CASCADE personnel (on foot) exposed to the hazard of vehicular traffic shall wear warning garments such as vests, jackets, or shirts manufactured in accordance with the requirements of the American National Standards Institute (ANSI)/International Safety Equipment Association (ISEA) 107-2004, High Visibility Safety Apparel and Headwear.

- ANSI/ISE 107-2004 Class 2 – Working near vehicular traffic or construction equipment of speeds less than 50 miles per hour (mph).
- ANSI/ISE 107-2004 Class 3 – Working near vehicular traffic of speeds greater than 50mph and/or nighttime hours.

10 CONFINED SPACE ENTRY

Confined spaces, including but not limited to trenches, ditches, holes, culverts, structures, and tanks, present multiple hazards including oxygen deficiency, toxic agent exposure, heat stress, engulfment, and other hazards.

Confined space entry is not anticipated nor is it authorized for CASCADE personnel at this Site. If it becomes necessary to enter a confined space at the Site, the EHS Department will be contacted and appropriate training, equipment and supervision will be put in place and entry will be made in accordance with a specific confined space entry permit approved by the EHS Department.

11 DECONTAMINATION

Decontamination will be performed only in designated areas. Decontamination areas will be selected based on the level of exposure established by the CASCADE SSO and this plan.

11.1 Personnel Decontamination

A minimal decontamination procedure consisting of washing exposed skin with soap and water shall be required. More or less extensive procedures for decontamination can be established in cases when the type and degree of contamination or the potential for contaminant transfer is judged to be greater or less than usual.

11.2 Vehicle and Equipment Decontamination

The focus of vehicle and equipment decontamination is to minimize the spread of contaminated material beyond a given area. During field activities, a variety heavy equipment (i.e. drill rig and injection rig) and small equipment (i.e. drive rods, sampling equipment and hand tools) is anticipated. Gross contamination will be removed from heavy equipment before leaving the exclusion zone. Sampling equipment and hand tools will be decontaminated using a detergent and water rinse method.

12 MEDICAL SURVEILLANCE

All CASCADE personnel are required to participate in the CASCADE medical surveillance program before being permitted to work on-site. Specific exceptions to the medical surveillance requirements may be granted by the SSO for site access by personnel performing non-intrusive activities and when the potential for exposure to site contaminants/chemicals is considered negligible while performing such non-intrusive activities (e.g. delivering supplies and materials to the site).

13 TRAINING

A matrix summarizing training requirements for CASCADE personnel, subcontractors, client personnel, visitors, and vendors is presented in Table 6.

Table 7 – Training Requirements

Personnel Type	Client/Site Specific Training (i.e. LPS)	Site-Specific (Tailgate)	First Aid and CPR	8- Hour Refresher	8-Hour HAZWOPER Supervisor	24-Hour HAZWOPER	40-Hour HAZWOPER
CASCADE Lead Operator	X	X[1]	X[2]	X	X		X
On Site CASCADE Personnel	X	X[1]	X[2]	X			X
Subcontractors[4]	X	X[1]			X[4]		X[4]
Visitors (escorted)		X[1]					
Visitors (un-escorted)	X	X[1]		X[3]		X[3]	
Vendors		X[1]		X[3]		X[3]	

Notes:
1 – A site-specific safety orientation must be given to all visiting/working personnel.
2 – not required if a minimum of 2 First Aid/CPR trained personnel on-site.
3 – Required for un-escorted visitors or vendors requiring access to controlled area to work on contaminated equipment.
4 – Subcontractor performing intrusive work inside the exclusion zone must have completed the initial 40-Hour HAZWOPER training and be current in their annual HAZWOPER refresher training.

14 SPILL PREVENTION AND CONTAINMENT

The following sections outline basic procedures related to proper response and mitigation for project chemical storage, containment and spill response from containers, systems or surfacing of chemical reagent injection solutions.

14.1 Chemical Management and Control

Liquid chemical containers will be stored in secondary containment or similar fixed facilities to contain leaks for easy recovery and to prevent contact with personnel and the environment.

As is determined by project, injection rigs and systems related to the injection and treatment process may be similarly staged in secondary containment or in areas where chemical contact with soil or surface waters can be mitigated.

14.2 Preventative Measures

Safety Data Sheets (SDS) and manufacturer data will be used to establish basic response protocols for the Site. The following preventative measures will be taken:

- Inspect all containers upon delivery to the Site for visible defects (if applicable).
- Set any 55-gallon drums on wooden pallets to facilitate transport via forklift or hand truck.
- Perform daily inspections of the temporary storage areas.
- Select flat areas for temporary storage away from high-traffic zones and storm or sewer drains/catch basins.

14.3 Spill Control, Response and Recovery

Most spills that may occur on CASCADE projects are considered to be non-emergency or incidental releases and as such, CASCADE personnel are competent in the procedures used to clean up these non-emergency, incidental spills and releases. Incidental releases are those that:

- Do not pose a significant safety or health hazard to personnel in the immediate area or to the persons assigned to clean it up;
- do not have the potential to become an emergency within a short period of time frame;
- do not present a potential for fire or explosion; or
- are limited in quantity, exposure potential, or toxicity.

The following steps will be implemented in the event of a spill or surfacing (if applicable):

- The CASCADE Site Supervisor and SSO will be notified immediately.
- Attempts shall be made to stop the source of the spill;
- shut off pumps, close valves and follow any other safety procedures for emergency shutdown of equipment as applicable;
- contain (dike) the spill using absorbent materials (booms, socks, pads, earth etc);
- determine if the spill can be completely contained/recovered with available resources;
- if necessary provide additional delineation of area using barricades, signage or personnel and restrict non-essential personnel from entering the area during containment or recovery;
- if spill cannot be completely contained/recovered with available resources, notify local emergency response agency;
- residual material not recovered and/or reused will be covered with an inert absorbent. The absorbent will be collected and containerize for disposal; and
- the area will then be washed thoroughly with water (if practical) to prevent slips, trips, and falls.

Control of large scale spills are generally beyond the training and capabilities of CASCADE personnel. In the event of a large scale spill, CASCADE personnel will act in a defensive role only and will contain and control from safe distances until emergency responders arrive at the site. A large scale spill is characterized as a spill that:

- Requires evacuation of personnel in the area because of quantity or toxicity of spilled material;
- presents, or has the potential to present conditions that are immediately dangerous to life and health (IDLH);
- presents a serious threat of fire or explosion (exceeds or has the potential to exceed the lower explosive limit [LEL] or lower flammable limit); and/or
- requires training, equipment, or expertise beyond that which is available at the site.

14.4 Record Keeping and Notifications

Non-emergency and incidental spills (i.e. surfacing) will be documented in the project field notes. Large scale spills will be documented on an incident report which will be forwarded to the EHS Department. The Client or Client On-site Representative will make any necessary notifications to off-site authorities.

15 EMERGENCY RESPONSE

In the event of a medical emergency or fire during field activities at the Site, the emergency telephone number shall be called from the Site on a mobile telephone or land line. A mobile telephone will be available during all field activities. On a daily basis and at each work area, the CASCADE Site Supervisor and/or SSO will verify that mobile telephones are operational. The CASCADE Site Supervisor and/or SSO will notify the Client Onsite Representative, CASCADE Operations Manager or immediate supervisor, and EHS Department immediately after appropriate medical aid has been rendered or emergency services have been summoned.

Pertinent personnel phone numbers are listed in Table 1. Site emergency contact information and phone numbers are listed in Table 2. A copy of the route to the nearest emergency medical facility is included as Appendix A.

A copy of this section, together with the appropriate emergency maps shall be maintained at all times, in a readily accessible location.

16 HEALTH AND SAFETY PLAN REVIEWS AND APPROVAL

CASCADE Site Supervisor/Site Safety Officer (SSO) Review and Acknowledgement
I acknowledge receipt of this HASP and accept that it is my responsibility to explain its contents to all Site personnel and cause these requirements to be fully implemented. Any change in conditions, scope of work, or other change that might affect worker safety requires me to notify the CASCADE EHS Department, operations manager, project manager and/or immediate supervisor; and the Client onsite representative.

Site Supervisor/SSO (Name/Signature)	Date Reviewed

CASCADE Project Manager Review and Acknowledgement
I have read and approved this Health and Safety Plan (HASP) with respect to project hazards, regulatory requirements, and CASCADE procedures. The final approved version of this HASP has been provided to the Site Safety Officer and Client Representative.

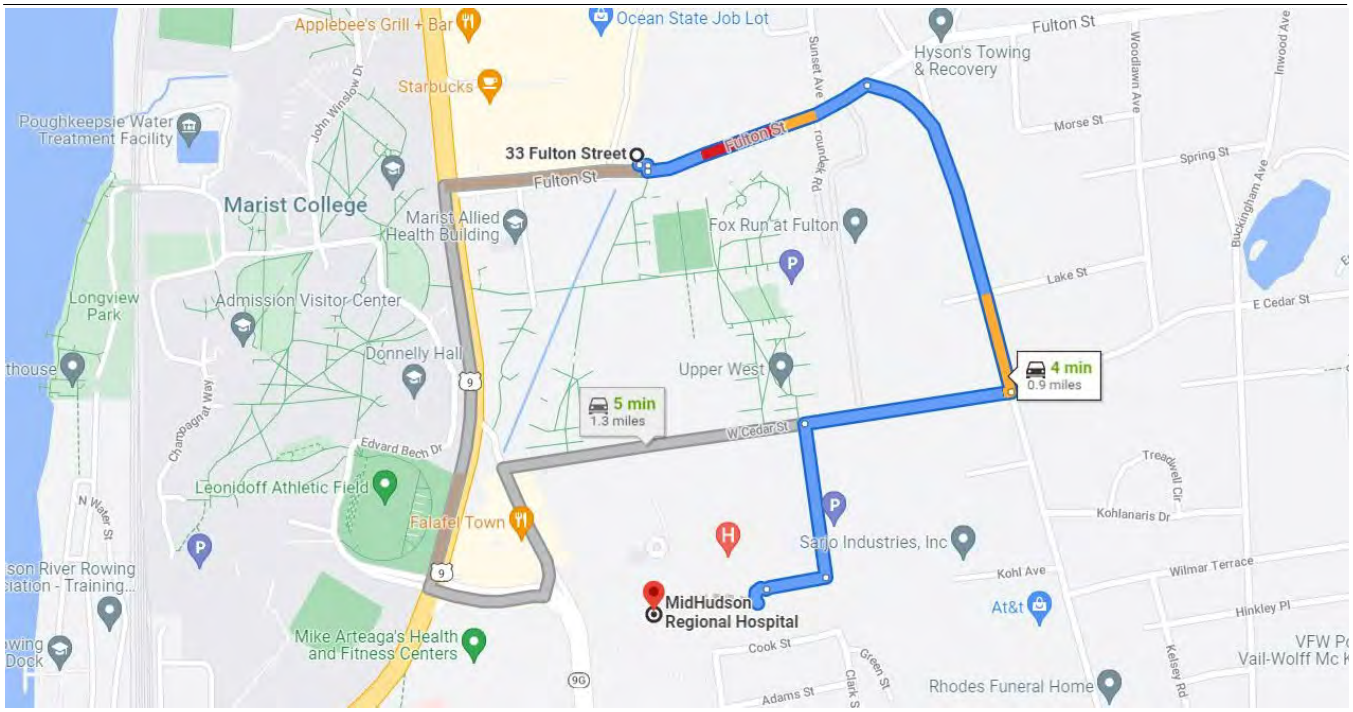
CASCADE Project Manager (Name/Signature)	Date Reviewed

17 HEALTH AND SAFETY PLAN REVIEW AND ACKNOWLEDGEMENT PAGE

All Site personnel are required to read the contents of this HASP and by signing below, acknowledge that they are familiar with and will abide by its provisions.

Name	Company	Signature	Date

APPENDIX A
Hospital Route Map



33 Fulton St

Poughkeepsie, NY 12601

Continue to Fulton St

10 s (69 ft)

1. Head east toward Fulton St

39 ft

2. Turn right toward Fulton St

30 ft

3. Turn left onto Fulton St

1 min (0.2 mi)

Continue on Fairview Ave to your destination

3 min (0.7 mi)

4. Turn right onto Fairview Ave

0.3 mi

5. Turn right onto W Cedar St

0.2 mi

6. Turn left onto Garden St Exd

0.1 mi

7. Turn right onto Webster Ave

289 ft

8. Continue straight

115 ft

MidHudson Regional Hospital

241 North Rd, Poughkeepsie, NY 12601

APPENDIX B
Applicable Job Safety Analysis

CASCADE
DRILLING | TECHNICAL SERVICES

JOB SAFETY ANALYSIS

Direct Push Operations, Track Rig & Remote Controlled

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept.

JSA Approved By: EHS Department

Date: 09/01/2019

JSA Number: DP006

Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)	x	Fall to Below (FB)	x	Noise	x	Oxygen Deficiency		Heat Stress		Water Contaminations	
Struck Against (SA)	x	Overexertion (OE)	x	Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	x
Contact By (CB)	x	Exposure (E)		Asbestos		Musculo-skeletal	x	Wind		Release to Ground	x
Contact With (CW)	x	Electric Shock (ES)		Other Dust	x	Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)	x			Hazardous Chemical		Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)	x			Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability	x		
Caught Between (CBT)	x			Carbon Monoxide				Habitat destruction	x		
Fall-same level (FS)	x			Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

X	X	X	X	X	X	☐	☐	☐	☐	☐	☐	☐
Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training	x	Ventilation	x	Hot Work	
Lockout / Tag Out	x	JSA's / SJSA	x	Illumination		Utility Proximity	
Guards, Barriers	x	Warning Signs		Ground Protection	x	Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops	x	MSDS (SDS)	x			Excavation	
GFCI							

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

JSA Title:	Direct Push Operations, Track Rig & Remote Controlled						
Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
1	Operating with remote control	Contact with - Running over your foot; Accidental movement of rig; Accidentally hitting person or fixed object	12	• When using wireless remote to move rig, stand to the left and rear if possible • Stay at least 3 feet away while moving rig • Observe the intended path of travel and use a spotter if available • Stop immediately if you lose site of the spotter • Avoid getting any closer to fixed objects than absolutely necessary • Keep people out of the line of fire • ***Always turn off remote control (to "off" position) and store in proper place prior to advancing probe rod. Engine must be restarted with key switch on control panel each time. The remote track and engine controls are only operational when the engine is started using the remote control box.***	6		
2	Operating inside buildings		8	• Ensure adequate ventilation and overhead clearance • Install secondary containment underneath the rig.	3		
3	Remove asphalt or concrete	Contact with Flying debris	5	• Visual inspection • Remove mesh or rebar with cutters	3		
		Cuts - Sharp objects such as concrete reinforcement materials		• Wear cut resistant gloves.			

4	Push Rod, collect samples	Contact with Pinch points	5	• Stay clear of moving parts • Raise pull latch to storage position • Use care handling and opening core barrel	3		
		Exposure to noise up to 115 dB		• Use “Show Your Hands” procedure. • Hearing protection must be worn (preferable plugs & muffs) • Wear nitrile gloves if there is a skin exposure potential • Upgrade to OSHA Level C if necessary (organic vapor respirator).			
		Exposure to Chemical or Hydrocarbon		• Steam clean rods between boreholes (use face shield and safety glasses) • Watch hand placement • Use correct tools for opening sleeves (macro core cutters only) • When opening sleeves, cut away from body			
		Cuts from sharp tools		• Place soil core on sturdy surface prior to cutting.			
5	Hand clear if needed	CONTACT WITH Hitting someone with hand auger	5	• Make sure work area is clear • Stay out of the line of fire • Do not exceed 50 lb. limit • Use “Safety in Motion” training	3		
		EXERTION - Back strain		• Use buddy system or mechanical advantage,			
6	Push Rod, collect samples	CONTACT WITH Pinch points	8	• Keep hand at least 6 inches from any pinch point • Watch hand placement, Stay away from moving parts • Use “Show Your Hands” procedure • Be aware of your foot placement when rig foot comes off ground • Hearing protection must be worn • Wear nitrile gloves under work gloves if there is a skin exposure potential • Upgrade to Level C if necessary (Stop Work, MOC, call Ops) • Decon equipment between hol • Wash hands before you eat or drink • Use cut resistant gloves • Use approved cutting devices • When opening sleeves, cut away from body • Place soil core on sturdy surface prior to cutting • Daily drill rig safety inspection completed and documented • Slip rings are “not” to be used under any circumstance • Use approved method for pulling rod out of hole	3		

7	Extracting stuck or tight rods	CONTACT WITH Getting struck by a bent rod when it is released	8	• If any visible bend or deviation in the rod is observed, call refusal • (Before refusal is called, discuss with client and Operation Manager.) • Do not use chains, wire cable or other non-approved pulling devices • Do not use equipment that is not designed to retrieve rod • Call Operations and to discuss options and possible drill out.	3		
		CONTACT WITH Breaking tools/ flying tooling		***Call Operations to discuss calling refusal with the direct push rig.***			

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
6-12	Moderate	Follow Procedure & Interim Controls can be used
13-17	Significant	Stop Work as needed. Interim Controls must be used
18-20	Extreme	Stop Work and Control Hazard before work resumes

Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks							
Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA MUST be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

CASCADE DRILLING | TECHNICAL SERVICES

JOB SAFETY ANALYSIS

Macro Core Sampling

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept

Date: 07/06/2021

JSA Approved By: EHS Department

JSA Number: DP007

Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)	x	Fall to Below (FB)	x	Noise	x	Oxygen Deficiency		Heat Stress	x	Water Contaminations	
Struck Against (SA)	x	Overexertion (OE)	x	Silica		Bloodborne pathogen		Cold Stress, Ice & Snow	x	Ground/Soil Contamination	
Contact By (CB)	x	Exposure (E)	x	Asbestos		Musculo-skeletal	x	Wind		Release to Ground	
Contact With (CW)	x	Electric Shock (ES)		Other Dust		Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)	x			Hazardous Chemical	x	Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)	x			Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability			
Caught Between (CBT)	x			Carbon Monoxide				Habitat destruction			
Fall-same level (FS)	x			Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

X	X	X	X	X	X							
Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training	x	Ventilation		Hot Work	
Lockout / Tag Out		JSA's / SJSA	x	Illumination		Utility Proximity	
Guards, Barriers	x	Warning Signs		Ground Protection		Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops	x	MSDS (SDS)				Excavation	
GFCI							

Notes: Inspect all of the Macro Barrel components. Replace worn items. Be alert to sharp edges..

JSA Title:	Macro Core Sampling						
Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
1	Assemble /Disassemble Macro core sampling tube.	Struck by wrench Muscle strain from overexertion Pin, pinch, caught in wrenches, rotation hazard.	8	• Use pipe wrench to tighten components. • Use proper lift techniques (bending at the knees and not at the waist) to lift assembly. • Stay clear of the wrench area. • Be sure the area is clear.	3		
2	Add / Remove sample liner from barrel.	Contact with machine Muscle strain from overexertion Exposure to contaminates in barrel Line of Fire	8	• Stay clear (1' – 2' distance) from moving machinery. • Use proper lift techniques by keeping elbows close to body while removing liner. • Known contaminates should be monitored with PID or four gas meter • Upgrade PPE to standards in NIOSH Chemical guide book • Do not stand in front of barrel, or when loosening cutting shoe	3		
3	Cutting sample liner tube	Hand Injury /struck by cutting tool Laceration / puncture wound from cutting tool.	8	• Liners will be placed on level surface area (i.e. a table) for opening and screening. • Use manufacture's cutting tool for opening the liners. • No fixed open blade knives. • Use type II cut resistant gloves while opening liners. • Cut away from hands and body	3		

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
6-12	Moderate	Follow Procedure & Interim Controls can be used
13-17	Significant	Stop Work as needed. Interim Controls must be used
18-20	Extreme	Stop Work and Control Hazard before work resumes

Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA __MUST__ be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

JOB SAFETY ANALYSIS — Backing and Moving Equipment

CASCADE DRILLING | TECHNICAL SERVICES

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept	Date: 09/01/2019
JSA Approved By: EHS Department	JSA Number: GEN005
	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)	x	Fall to Below (FB)	x	Noise		Oxygen Deficiency		Heat Stress		Water Contaminations	
Struck Against (SA)		Overexertion (OE)	x	Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	
Contact By (CB)		Exposure (E)		Asbestos		Musculo-skeletal		Wind		Release to Ground	
Contact With (CW)	x	Electric Shock (ES)		Other Dust		Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)				Hazardous Chemical		Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)				Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability			
Caught Between (CBT)	x			Carbon Monoxide				Habitat destruction			
Fall-same level (FS)	x			Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection
X	X	X	X	X	X	☐	☐	☐	☐	☐	☐	☐

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training		Ventilation		Hot Work	
Lockout / Tag Out		JSA's / SJSA		Illumination		Utility Proximity	
Guards, Barriers		Warning Signs		Ground Protection		Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops		MSDS (SDS)				Excavation	
GFCI							

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

JSA Title:	Backing and Moving Equipment						
Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
1	Upon Arrival (at any location, including: site, fuel station, rest area, hotel, etc).	CONTACT WITH Striking people or objects because of rear/front end swing	9	• Plan your exit upon arrival. If you have a choice upon backing on arrival and backing when leaving, choose to back upon arrival. • Avoid backing. If possible, position truck so backing is not necessary. • Always use a spotter *when backing any vehicle on a job site*. • Use more than one spotter if necessary (close quarters, etc). • Always complete a 360 degree walk around before moving a vehicle. Secure loose cargo, and check for obstacles. Move items out of path. • Never move any equipment with the mast in the raised position. Moving any equipment with the tower in the raised position is prohibited. • Gloves must be worn when involved in a task requiring the use of hands. Gloves must be cut resistant level 3 and must be appropriate to the task	4		
2	Spotter Location	CONTACT WITH Striking people	9	• STOP the vehicle immediately if you lose sight of your spotter. • STOP and discuss hand signals if there is confusion. • If no spotter is available – GET OUT AND LOOK!	4		
3	Passing under low clearances	CONTACT WITH Objects - Property damage	7	• If clearance is a body width (approx 18 inches) or less in front, back, side or above; a spotter must be used and speed shall not exceed 1 (one) mph. • The spotter is to prevent the driver from passing under any fixed object with four inches or less clearance. (Note: Power lines require minimum 1 foot clearance, see below.)	3		
4	Passing under utility lines	CONTACT WITH Power lines - Electrocution	10	• If passing underneath a utility line with 3 feet or less clearance, a spotter must be used and the driver is to restrict his speed to 1 mile per hour. • The spotter is to prevent the driver from passing under any utility line with 1 (one) foot or less clearance. (Note: Call Stop Work and evaluate situation, call Operations. Do not proceed if clearance is less than 1 ft.)	4		

5	Backing a Vehicle	CONTACT WITH Striking people or objects while backing	10	• Always conduct a 360 walk around prior to backing/moving a vehicle. • Review & agree on the planned movement, procedures, and hand signals. • Do not move the vehicle while discussing any planned movement. • Driver must keep windows down, remove ear plugs, and turn off radio so that the driver can hear any verbal instructions from spotter. • Any passengers not involved as a spotter should assist driver by being attentive, watching side view mirror, and minimizing unnecessary conversation. • Driver must make sure the spotter is knowledgeable on what to look for including overhead obstructions and front end swing. • Sound horn prior to backing if backup alarm is inoperative. • Back slowly! No more than 1 (one) mph. Keep your eye on the spotter. • Make sure there are no people or vehicles with potential to move into your path. • If you must back more than 60 feet, or two truck lengths, then you must STOP and use GOAL every 50 feet (unless there is nothing within range).	4		
6	Forward Movement on Site and in Close Quarters	CONTACT WITH Striking objects and/or people in front of the vehicle	7	• Request help of a Spotter if conditions warrant (overhead or tight quarters). • Conduct a 360 walk around, as outlined above. • Driver is to pull forward at no more than 2 mph • Driver is to watch all moving and fixed objects (high & low) while moving forward • If there are any overhead obstructions in the area, position a spotter to the front of the equipment. • Always check the right front blind spot before making a forward right turn.	4		
7	Coupling with a trailer	CONTACT WITH – Caught between truck and trailer	10	• When backing up to connect with a trailer, lining up to dump soil, or similar actions, the spotter will never stand directly behind the vehicle while it is moving. “Never stand in the Line of Fire”. • Spotter must remain visible in mirror(s), maintain eye contact w/ Driver. • Spotter must signal Driver to stop before checking alignment. • Driver must stop before Spotter steps behind vehicle to check alignment.	4		

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
6-12	Moderate	Follow Procedure & Interim Controls can be used
13-17	Significant	Stop Work as needed. Interim Controls must be used
18-20	Extreme	Stop Work and Control Hazard before work resumes

Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	Sequence of Job Steps Break Down Job Into Steps	Potential Hazards & Impacts Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	Risk Rating per Action	Procedure or Action Required Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	Risk Rating Post Action	Responsible Person(s) - Initials	Mitigation on Steps Verified

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA ***MUST*** *be posted on-site and be available to any employee upon request.*

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

JOB SAFETY ANALYSIS

Decontamination of Equipment (Pressure Washer & Steam Cleaner)

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept	Date: 09/01/2019
JSA Approved By: EHS Department.	JSA Number: GEN018
	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)	x	Fall to Below (FB)	x	Noise		Oxygen Deficiency		Heat Stress		Water Contaminations	
Struck Against (SA)		Overexertion (OE)	x	Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	
Contact By (CB)		Exposure (E)		Asbestos		Musculo-skeletal		Wind		Release to Ground	
Contact With (CW)	x	Electric Shock (ES)		Other Dust		Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)				Hazardous Chemical		Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)				Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability			
Caught Between (CBT)	x			Carbon Monoxide				Habitat destruction			
Fall-same level (FS)	x			Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection
X	X	X	X	X	X	☐	☐	☐	☐	X	☐	☐

Other PPE Required: Faceshield required. Tyvek or other chemical protective suit may be required, consult HASP.

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training	X	Ventilation	X	Hot Work	
Lockout / Tag Out		JSA's / SJSA	X	Illumination	X	Utility Proximity	
Guards, Barriers		Warning Signs		Ground Protection	X	Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops		MSDS (SDS)				Excavation	
GFCI	X						

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

JSA Title:	Decontamination of Equipment (Pressure Washer & Steam Cleaner)						
Step No: Logical order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** before action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** following action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
1	Decon set up	Contact with moving equipment & pedestrian traffic		- Always use a spotter when backing. - Set up on level ground and chock wheels. - Only move trailer w/ forklift w/ proper hitch attachment - Use caution when uncoupling trailer – Be aware of side pressure on tongue and stay out of line of fire. - Set up exclusion zone around decon station - Gloves must be worn when involved in a task requiring the use of hands. Gloves must be cut resistant level 3 and must be appropriate to the task, and "impact resistant"			
		Slip/trip/fall hazards – hoses, tools		- Keep hoses coiled or tucked out of the way if not in use. - Place buckets, plastic and equipment in a level area away from other site activities conducted at the site. - Keep work area neat with equipment properly stored to avoid trip hazards. - Maintain good housekeeping. - Close all drain plugs (decon trailers, etc.)			
		Back strain and Pinch Points – loading & unloading equipment		- Do not lift over 50 pounds without assistance. - Bend knees, keep straight back, lift with legs, do not twist. - Carefully place, do not throw, heavy tooling into decon. - Wear appropriate gloves to protect hands from potential contamination, sharp steel, pinch points, and heavy tools.			
2	Steam cleaner and Pressure Washer inspection	Fire		- Fire extinguisher must be accessible nearby. - Wet down dry grass, leaves, or other combustibles nearby. - Be sure the steamer is inspected and connected properly. - Always shut down prior to refueling equipment. - Use internal combustion equipment in well ventilated area			
		Contact with flames or hot water		- Wear appropriate gloves to protect from heat. - Keep other people clear of the operation. - Keep both hands on the wand handles at all times. - Minimum 48 inch wand. - Maximum 3500 psi. > 3500 psi variance required - No cutting tips allowed. (Use only the Green, or White Tips). Zero rated tips are not allowed. - Direct spray at equipment and be cautious of overspray.			

3	Loading Tooling onto decon unit	Contact with Pinch Points, shifting loads		• Communicate w/ co-worker when lifting heavy tooling. • Do not stack casing/auger in the back of the decon • Always chock tooling to prevent rolling out of unit. • *Confirm drill tooling is **properly secured** with appropriate chocking device to prevent rolling, or shifting during task.* • *Chocking bar should be used to hold (staged) drill pipe in place, while 1 pipe is being decontaminated. **NOTE:** pipe being decontaminated will also have chocking bar to secure & prevent it from rolling forward on its own.* • *Thoroughly **inspect ALL** tooling for sharp 'metal edges' or damage that could cut, pinch, or "catch" on hand/fingers.* • ***Required gloves**: cut level III, task appropriate & "impact resistant" must be used during task* • *Proper engineering controls should be in place to prevent the augers from rolling forward, prior to decon task.*			
4	Pressure Washer and Steam Cleaner operation (Decon of Tools, Augers, Rods, Casing, Tooling, etc.	Contact with - Electrical shock hazard		• Verify electrical equipment is connected with a GFCI. • Inspect electrical switches and cords for abrasions, cuts, wear prior to use.			
		Exposure to Noise		• Wear proper hearing protection. • Shut down if pedestrians or others not wearing proper PPE approach.			
		Contact with and Exposure to High Pressure		• **Keep both hands on wand at all times** – Never hold an item with one hand while spraying it with the other. • Keep wand aimed at equipment. Never point wand at any person. Ensure wand is correct length for task. • Verify all personnel are out of the line of fire during decon activities. • Be aware of and prevent overspray.			
		Contact with Flying debris Exposure to contaminated soils		• **A Faceshield is required** when using pressure washer. • Wear appropriate gloves to protect against contaminated soils, as well as cuts, impact, and heat. • Keep others away from decon operations and shut down if others approach. **Vapor Exposure hazard, and state that PID monitoring will be performed, with an Action Level of 0.5 ppmv based on Vinyl Chloride – where workers should pause work and move away from the source, and if necessary don APR with OV cartridges.**			
		Slips/trips/falls		• Keep hose(s) coiled or tucked out of the way. • Keep tools organized and out of pathways. • Use caution if stepping on plastic which is very slippery when wet. • Know that plastic can cover and hide trip hazards such as curbs, potholes, etc.			

		Exposure to Cold Temperatures		• Be aware of potential for ice to form around decon unit and apply sand/salt as needed.			
5	Cleanup	Exposure to contamination from contaminated soils and spills Sprain/Strain from moving drums		• Use caution when transferring decon water to drums. • Do not allow decon water to splash personnel or spill to ground. • Shovel washed soils from unit and contain in drums. • Seal all drums tightly. • Use drum dolly or approved method to handle/move drums. Always use mechanical advantage. • Get assistance as needed. • Use liftgate or other equipment to move drums long distances, up steep slopes, or across rough terrain.			

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
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Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA <u>MUST</u> be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

CASCADE
DRILLING | TECHNICAL SERVICES

JOB SAFETY ANALYSIS

Fueling Operations

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept	Date: 09/01/2019
	JSA Number: GEN025
JSA Approved By: EHS Department	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)	x	Fall to Below (FB)		Noise		Oxygen Deficiency		Heat Stress		Water Contaminations	x
Struck Against (SA)		Overexertion (OE)		Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	x
Contact By (CB)		Exposure (E)	x	Asbestos		Musculo-skeletal		Wind		Release to Ground	x
Contact With (CW)	x	Electric Shock (ES)		Other Dust		Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)				Hazardous Chemical	x	Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)				Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability			
Caught Between (CBT)				Carbon Monoxide				Habitat destruction			
Fall-same level (FS)	x			Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection
X	X	X	X	X	X	☐	☐	☐	☐	☐	☐	☐

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training		Ventilation	x	Hot Work	
Lockout / Tag Out		JSA's / SJSA	x	Illumination		Utility Proximity	
Guards, Barriers		Warning Signs		Ground Protection		Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops		MSDS (SDS)	x			Excavation	
GFCI							

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

JSA Title:		Fueling Operations					
Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
1	Park vehicle	CW, SB - moving vehicle	8	• ***No Smoking. No cell phone use.*** • Set parking brake, turn engine off. Some vehicles require power on when refueling – check to see if this is the case. • Exit vehicle using 3 points of contact and Chock wheels. • Be aware of other traffic in the vicinity. • Never fuel while charging (jumping) batteries. • Fuel on level ground when possible. Uneven surfaces may cause fuel levels to vary. Recognize that down slope tank may spill when cap is removed. • Understand how dual tanks operate. • Insure spill kit is on hand, complete, and ready to use if needed.	3		
2	Inspect hose, nozzle, and area.	Spill, Fire	5	• Survey area for open flames or other spark generating work. Do not fuel if so. • Always visually inspect hose and nozzle before use. • Recognize if nozzle has manual or automatic shut-off. • If fueling from a fuel safety can, or other container, ensure you have level ground before setting can down. Ensure stable footing before fueling from can. • Inspect nozzle to confirm if there is a locking mechanism. If so, it should be shutoff & removed, before use.	3		
3	Adding fuel to tank	Spill, Fire	8	• NEVER LEAVE NOZZLE UNATENDED WHILE FUELING and never prop open nozzle or latch on safety fuel can. • Set up spill protection under area where fueling is being done. (For dual tank systems spill control must be placed under both tanks) • Survey area for uneven surfaces and other tripping hazards • Keep work area free of excess material and debris. Remove all trip hazards. • Ensure contact is made between nozzle and metal side of fuel port • Do not overfill. When complete, secure nozzle and fasten gas cap. • Clean up any spills immediately and report spill quantity and type to EHS for determination of Federal, state, or local reporting requirements.	3		

4	Securing operations	E - fuel and vapors	5	• Replace and secure nozzle and fill cap. • Place fuel cans in safe, well ventilated location away from ignition sources and secured from potential to tip/spill.	3		

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
6-12	Moderate	Follow Procedure & Interim Controls can be used
13-17	Significant	Stop Work as needed. Interim Controls must be used
18-20	Extreme	Stop Work and Control Hazard before work resumes

Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA MUST be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

CASCADE DRILLING | TECHNICAL SERVICES

JOB SAFETY ANALYSIS — Hot Weather Operations

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept	Date: 09/01/2019
	JSA Number: GEN032
JSA Approved By: EHS Department	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)		Fall to Below (FB)		Noise		Oxygen Deficiency		Heat Stress		Water Contaminations	
Struck Against (SA)		Overexertion (OE)		Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	
Contact By (CB)		Exposure (E)		Asbestos		Musculo-skeletal		Wind		Release to Ground	
Contact With (CW)		Electric Shock (ES)		Other Dust		Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)				Hazardous Chemical		Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)				Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability			
Caught Between (CBT)				Carbon Monoxide				Habitat destruction			
Fall-same level (FS)				Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection
X	X	X	X	X	X	☐	☐	☐	☐	☐	☐	☐

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training		Ventilation		Hot Work	
Lockout / Tag Out		JSA's / SJSA		Illumination		Utility Proximity	
Guards, Barriers		Warning Signs		Ground Protection		Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops		MSDS (SDS)				Excavation	
GFCI							

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

JSA Title:	Hot Weather Operations						
Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
This JSA must be reviewed prior to start of shift whenever temperatures are expected to exceed 85 deg F. Also reference CDLP SOP for Heat Related Illness.							
1	Prepare in Advance – Adjustments must be made for individual tolerances	E – sun and heat CDLP offices in some locations may experience extreme heat conditions on a regular basis. Crews based in those locations are better acclimated to the heat. Crews based in Northern locations are not use to extreme heat.	12	**All employees have Stop Work Authority for extreme heat conditions** ***This JSA is unique in that it should be reviewed several days in advance. Preparation should include:*** • More Water - Days in advance, get all crew members in the habit of drink plenty of water - small amounts almost constantly • Less Caffeine - Stop drinking alcohol, coffee, caffeinated carbonated soft drinks or energy drinks (Monster, Rock Star, Red Bull, etc.) starting at least 24 hours before start of work. Do not use over-the-counter medications that would inhibit your heat tolerance. • Use cooling methods such as water spray bottles, wet towels and/or install misting systems and/or fans. • Bottle water is recommended • Bring an ice chest • Get the crew mentally prepared by giving as much advance notice as possible and having them read this JSA • Crew members should get plenty of additional rest and sleep time • Bring pop-up shade tents, plenty of drinking water, and sunscreen. • Bring Gatorade or other electrolyte drink • Make sure all crew members are healthy • Plan to dress for the situation – 1) Wear light weight, light colored (white if possible) cotton clothing, 2) Wear broad rimmed white hard hats. (Long sleeves must still be worn on certain sites.)	6		

		E – working on paved sites, work around heavy equipment, and work in open areas w/ no shade.		• Add 10 degrees to measured temperature and consult Heat Index chart if these conditions apply. (Heat Chart below).			
		Level C work		• If wearing chemical resistant clothing, or double layered clothing (such as rain gear over normal work clothes), then extra caution should begin at temperatures above 57 degrees F.			
2	Day of the Job	E - Heat (without the need for respirators or additional protective clothing) And Sun Exposure	12	• Any time temperatures exceed 100 deg F consult office to find out what the humidity levels are. Consult weather.com. • Any time the DANGER level is reached; work must be restricted to 8 hour shifts. Cooling devices, such as misters and shade, should be used. • Any time the EXTREME DANGER level is reached all work must cease. Adjustments in the workday such as starting work at dawn or breaking in the heat of the day for several hours may be necessary. • Do not drink alcohol, coffee, caffeinated carbonated soft drinks or energy drinks (Monster, Rock Star, Red Bull, etc.) on the day of the job. • Wear light weight, light colored (white if possible) cotton clothing. (BP still requires long sleeves.) • Take short water breaks at least every 15 minutes – more often if needed • Take 10 minute breaks in the shade every hour – more often if needed • Drink small amounts of Gatorade every hour or as needed • Take an adequate lunch break – at least 30 minutes • Drink plenty of water • Watch for all signs of heat stress – make adjustments as needed • Each crew member should apply sun screen to exposed skin before the start of the job. Re-apply as needed. • Set up pop-up shade tent • Do not work alone – pay attention to co-workers and look for any sign of heat illness.	6		

Heat Index Chart

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
6-12	Moderate	Follow Procedure & Interim Controls can be used
13-17	Significant	Stop Work as needed. Interim Controls must be used
18-20	Extreme	Stop Work and Control Hazard before work resumes

Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA <u>MUST</u> be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

CASCADE DRILLING | TECHNICAL SERVICES

JOB SAFETY ANALYSIS

Jackhammer Use

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept	Date: 09/01/2019
JSA Approved By: EHS Department	JSA Number: GEN038
	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)	x	Fall to Below (FB)	x	Noise	x	Oxygen Deficiency		Heat Stress		Water Contaminations	
Struck Against (SA)		Overexertion (OE)	x	Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	
Contact By (CB)		Exposure (E)		Asbestos		Musculo-skeletal		Wind		Release to Ground	
Contact With (CW)	x	Electric Shock (ES)		Other Dust		Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)				Hazardous Chemical		Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)				Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability			
Caught Between (CBT)	x			Carbon Monoxide				Habitat destruction			
Fall-same level (FS)	x			Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection
X	X	X	X	X	X	☐	☐	☐	☐	X	☐	☐

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training	x	Ventilation		Hot Work	
Lockout / Tag Out		JSA's / SJSA	x	Illumination		Utility Proximity	
Guards, Barriers		Warning Signs		Ground Protection		Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops		MSDS (SDS)				Excavation	
GFCI							

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
1	Unload jackhammer	CUTS- Pinch finger	8	• Because jackhammers typically exceed the 50 pound weight lifting limit, two people should be used to load/unload the jackhammer. • Do not put fingers between two pieces of steel or other hard object • Be aware of hand placement • Keep firm grip on jack hammer • Do not lean tool in upright position (unattended).	3		
2	Connect air line, or power cord	CONTACT WITH Hose coming disconnected	5	• Always use whip checks, inspect quick connect. • Inspect hose/power cord for cracks or wear. Use GFCI if electric. • If using Chicago fittings, be sure they are pinned or wired closed • High pressure air connections must be banded, hose clamps are not permitted.	3		
3	Using jackhammer	EXERTION - Back strain	12	• Because jackhammers exceed the 50 pound weight limit and are designed for one-man operation, caution must be used to prevent back strain. Move jackhammer to side while Helper clears debris • Communicate and use “Show Your Hands” while clearing debris. • Operator must use two hands & maintain physical control of jackhammer at all times. • Shut off air (or unplug) and bleed the line before setting tool on ground. • Place, do not throw, debris into drum	6		
4	Disconnect supply hose	CONTACT WITH Flying hose	8	• Close valve on air supply line • Relieve pressure from line. • Disconnect air supply line. • Remove whip check last.	3		
5	Stow jackhammer	CUTS- Pinch points	8	• Verify air pressure has been released from jackhammer. • Using two people, as in 1 above, carefully stow tool.	3		

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
6-12	Moderate	Follow Procedure & Interim Controls can be used
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18-20	Extreme	Stop Work and Control Hazard before work resumes

Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA MUST be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

CASCADE DRILLING | TECHNICAL SERVICES	JOB SAFETY ANALYSIS	Lightning, Wind, Snow (Adverse Weather)

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept	Date: 09/01/2019
	JSA Number: GEN040
JSA Approved By: : EHS Department	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)		Fall to Below (FB)		Noise		Oxygen Deficiency		Heat Stress		Water Contaminations	
Struck Against (SA)		Overexertion (OE)		Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	
Contact By (CB)		Exposure (E)		Asbestos		Musculo-skeletal		Wind		Release to Ground	
Contact With (CW)		Electric Shock (ES)		Other Dust		Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)				Hazardous Chemical		Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)				Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability			
Caught Between (CBT)				Carbon Monoxide				Habitat destruction			
Fall-same level (FS)				Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection
X	X	X	X	X	X	☐	☐	☐	☐	☐	☐	☐

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training		Ventilation		Hot Work	
Lockout / Tag Out		JSA's / SJSA		Illumination		Utility Proximity	
Guards, Barriers		Warning Signs		Ground Protection		Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops		MSDS (SDS)				Excavation	
GFCI							

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

JSA Title:	Lightning, Wind, Snow (Adverse Weather)						
Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
1	Prepare for inclement weather	E – extreme weather	3	• Dress for the situation – Rain gear, rain boot with steel toes, extreme weather gear and/or warm clothing, hard hat liners or stocking cap under hard hat • Dress in layers, avoid cotton. • Bring spare dry clothing for trip home • Do not wear loose clothing such as scarves, coat tail, or cuffs • Rain gear and clothing with permanently attached hoods is not to be used. • All hoods must be of the break-away type (Velcro or snaps) • Wear boots with good non-skid soles • Put down salt or sand on icy ground. Do not use plastic sheeting • Avoid elevated surfaces such as the rig deck • Check area for snow covered obstructions. Avoid stepping in puddles • Do not leave tools laying on the ground – increase housekeeping efforts	3		
2	Lightning	E, CW, SB, ES - lightning	17	• If lightning is seen or thunder is heard, shut down operations and if time permits, lower the mast and get away from the drill rig • Evacuate to a safe area, secure building or cab of another vehicle • After the last observation of lightning and/or thunder, wait 30 minutes before resuming work to ensure danger has past.	10		
3	High Winds	E – high wind SB – airborne objects CW – rig toppling	17	• All elevated wind speeds must be evaluated for the type of rig • Stop Work Authority should be exercised whenever anyone believes wind creates an additional hazard • 30 mph wind speed should trigger at least a temporary shutdown to evaluate specific conditions – the higher the profile of the rig the higher the concern • 35 mph wind speed is considered the limit for safe operations. Any resumption of work at 35 mph or above must be approved by the area VP. (If in doubt about the possible wind speed, consult weather.com or obtain a wind gauge.) • 20 mph wind speeds require the use of ANSI approved goggles	10		

				• Secure anything that can become flying debris • Follow weather and news reports so you know how much danger you're facing. • Have open communication with all personal involved in the task. Consider if it is safe to continue to work.			
4	Snow and Rain	SB – other vehicles	12	• Avoid setting up at the bottom of the hill without substantial barricades such as cement K-rail or heavy equipment • All vehicle traffic areas should have substantial barricades • While spotting vehicles, stay out of line of traffic and potential skid zone • When walking out of protected areas, increase awareness of vehicles and there reduced ability to stop	6		
		CW – vehicle hitting objects or other people		• Do a thorough pre-trip inspection to include: carrying proper tire chains; windshield is clean and washer reservoir is full; wipers operate; head/tail lights are clean; tires in good condition; defroster is operational; emergency equipment in place; review most recent 90-day inspection and previous DVIR; ensure brakes are operational; vehicle is mechanically sound • Re-check load and pre-trip items whenever you stop. • Drive at an appropriate speed for the weather conditions – slow • Increase following distance to 8 seconds or more • Ensure that you remain well rested and alert			
		CW – buried utilities		• Rain can wash locate markings away – you must maintain locate markings. • Snow can cover locate markings, again, you must maintain markings • If snow covers utility locate markings upon arrival, and you have not recently been to the site, you will need to consider how you can observe all marks (do you need client to hire plow service?). You may have to call Stop Work if you cannot observe all markings.			

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
6-12	Moderate	Follow Procedure & Interim Controls can be used
13-17	Significant	Stop Work as needed. Interim Controls must be used
18-20	Extreme	Stop Work and Control Hazard before work resumes

Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA MUST be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

CASCADE DRILLING | TECHNICAL SERVICES

JOB SAFETY ANALYSIS	Proper Lifting Techniques

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept	Date: 09/01/2019
JSA Approved By: EHS Department	JSA Number: GEN051
	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)	x	Fall to Below (FB)	x	Noise		Oxygen Deficiency		Heat Stress		Water Contaminations	
Struck Against (SA)		Overexertion (OE)	x	Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	
Contact By (CB)		Exposure (E)		Asbestos		Musculo-skeletal		Wind		Release to Ground	
Contact With (CW)	x	Electric Shock (ES)		Other Dust		Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)				Hazardous Chemical		Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)				Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability			
Caught Between (CBT)	x			Carbon Monoxide				Habitat destruction			
Fall-same level (FS)	x			Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

X	X	X	X	X	X	☐	☐	☐	☐	☐	☐	☐
Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training		Ventilation		Hot Work	
Lockout / Tag Out		JSA's / SJSA		Illumination		Utility Proximity	
Guards, Barriers		Warning Signs		Ground Protection		Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops		MSDS (SDS)				Excavation	
GFCI							

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

JSA Title:		Proper Lifting Techniques					
Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action		
1	Lifting in the Green Zone	EXERTION - Back Strain from repetitive motion or lifting overweight items.	8	• Use "Smart Setup" by locating heavy items where people can pick them up without bending, crouching, or over-reaching. • Get help with heavy or awkward objects. • **Observe 50 pound lifting limit.** *<u>Exceptions</u>*: 1. Using a tool that is designed for single person operations such as a jackhammer. (See JSA Jackhammer Use) 2. bagged materials weighing up to 60 pounds 3. Small items weighing up to 60 lbs and designed for one person. 4. When two people are lifting an object weighing up to 120 pounds. • Lifting heavier drill tooling (auger, rods, casing, etc) is NOT an exception; use of mechanical means, such as the sand line, is required. • Lift with elbows as close to your body as possible. • Move item or body so that you do not have to extend your reach. • Use leverage to your advantage. • Do not twist and reach or lift – Point your toe in the direction of the object. • Consider total (cumulative) weight if carrying multiple items. *<u>Example</u>*: delineator bases weigh 11 lbs, you may only carry 4 at a time.	3		
2	Lifting in the Yellow Zone	EXERTION - Back Strain due to lifting that requires you to reach about 6 inches away from your body	12	• "Position Your Elbows Closer" by pulling, or sliding, or tilting the object toward your body before you lift it up • Take one step closer to the object to position it closer to your body • Do not twist and reach or lift – Point your toe in the direction you are reaching.	6		

3	Lifting in the Red Zone	EXERTION - Back Strain due to lifting, carrying, pushing or pulling. Even small objects can cause strain with your arms more than 6” from your body especially if the action is repetitive	13	• “Mechanical Advantage” - Use tools such as barrel dollies, wheel borrows, and forklifts • “Build A Bridge” is another Red Zone technique. Extend one foot forward and build a bridge with one hand. Extend the Same Side Hand as the extended foot to reach for the object. (This reduces twisting). You can also “build a bridge” by putting your arm on your leg to support your body when bending over or reaching for an object under a table • “Re-energize” These are short breaks, stretches, and/or exercises that speed up soft tissue recovery and help the body deal with the stress • Do not twist and reach or lift – Point your toe in the direction you are reaching.	10		
4	Lifting in the High Red Zone	EXERTION - Back Strain from reaching for a object that is over your head	17	• Use your “Line of Strength and Balance” by extending one foot forward and reach with the same hand and foot • Do not twist and reach or lift – Point your toe in the direction you are reaching.	10		
5	Lifting in the Low Red Zone	EXERTION - Back strain from twisting and reach behind you or to the rear	17	• Do not twist and reach or lift • Point your toe in the direction you are reaching.	10		

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
6-12	Moderate	Follow Procedure & Interim Controls can be used
13-17	Significant	Stop Work as needed. Interim Controls must be used
18-20	Extreme	Stop Work and Control Hazard before work resumes

Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	Sequence of Job Steps Break Down Job Into Steps	Potential Hazards & Impacts Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	Risk Rating per Action	Procedure or Action Required Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	Risk Rating Post Action	Responsible Person(s) - Initials	Mitigation on Steps Verified

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA <u>MUST</u> be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

CASCADE
DRILLING | TECHNICAL SERVICES

JOB SAFETY ANALYSIS — Well Box Removal

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Dept	Date: 09/01/2019
JSA Approved By: EHS Department	JSA Number: GEN082
	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)		Fall to Below (FB)		Noise	x	Oxygen Deficiency		Heat Stress		Water Contaminations	
Struck Against (SA)		Overexertion (OE)	x	Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	
Contact By (CB)		Exposure (E)	x	Asbestos		Musculo-skeletal		Wind		Release to Ground	
Contact With (CW)	x	Electric Shock (ES)		Other Dust	x	Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)				Hazardous Chemical		Insects (ticks, bees, spiders, etc)	x	Visibility (Fog)			
Caught In (CI)				Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability			
Caught Between (CBT)	x			Carbon Monoxide				Habitat destruction			
Fall-same level (FS)	x			Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection
X	X	X	X	X	X	X	☐	☐	☐	X	☐	☐

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training		Ventilation		Hot Work	
Lockout / Tag Out		JSA's / SJSA		Illumination		Utility Proximity	
Guards, Barriers		Warning Signs		Ground Protection		Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops		MSDS (SDS)				Excavation	
GFCI							

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

JSA Title:	Well Box Removal						
Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
1	Remove old well box	SB - vehicle	8	• Set up traffic control and exclusion zone appropriate for site conditions	3		
		CW - Spiders, sharps		• Remove monument lid and inspect carefully before reaching in. • Wear all PPE, including appropriate gloves to prevent vs cuts, pinch points.			
		E - loud noise, dust		• Wear adequate hearing protection • Avoid breathing dust by staying upwind and/or wearing a dust mask.			
		CW – pinch points		• Refer to JSA Jackhammer Use • Inspect equipment, tools, and hoses prior to use. • Make sure hoses are connected properly and whip checks are used at connections. • Use “Show Your Hands” procedure			
		FS - Slips, trips. Falls		• Maintain good housekeeping, watch footing around hoses. • Hoses and all tools and materials, bust be kept within the exclusion zone. • Coil or stow hose and tools out of the way when not in use. • Cover any open hole left unattended.			
		CW - flying concrete		• Communicate with co-workers and make sure nobody is in the way • Safety glasses **and face shield** or goggles just be worn when using jackhammer.			
		OE - back strain		• Keep back straight • If point gets stuck, release from hammer and use another point • Lift with your legs, keeping your back straight and head up • One Co-worker removes debris while other operates jackhammer • Take turns operating jackhammer to minimize fatigue. • Place, do not throw, rubble into container			
2	Surface completion	Only if replacing monument	5	• Refer to JSA Well Box Installation.	3		

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
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Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA MUST be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

CASCADE DRILLING | TECHNICAL SERVICES

JOB SAFETY ANALYSIS

Covid-19 – Mitigating Exposure

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Department	Date: 04/06/2020
JSA Approved By: EHS Department	JSA Number: JSA-GEN 119 – COVID-19
	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)		Fall to Below (FB)		Noise		Oxygen Deficiency		Heat Stress		Water Contaminations	
Struck Against (SA)		Overexertion (OE)		Silica		Blood borne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	
Contact By (CB)	X	Exposure (E)	X	Asbestos		Musculo-skeletal		Wind		Release to Ground	
Contact With (CW)	X	Electric Shock (ES)		Other Dust		Fauna (bears, snakes, Etc.)		Lightning		Surface Contamination	X
Caught On (CO)				Hazardous Chemical		Insects (ticks, bees, spiders, etc.)		Visibility (Fog)		Cross Contamination (CC)	X
Caught In (CI)				Hydrogen Sulfide		Flora (poison ivy, etc.)		Soil Stability			
Caught Between (CBT)				Carbon Monoxide		Inhalation Hazard	X	Habitat destruction			
Fall-same level (FS)				Methane		Ingestion Hazard	X	Air Contamination	X		

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall Protection
X	X	X	X	X	X		X					

Other PPE Required: Disinfectant Spray, Paper towels, Disinfectant wipes, Tissues, Nitrile Gloves, Safety Glasses, N-95 masks, Hand sanitizer, Soap and water

Other Controls required if marked with 'X':

Engineering Controls		**Administrative Controls**		**Environmental Controls**		**Permits**	
Interlock		Training	X	Ventilation		Hot Work	
Lockout / Tag Out		JSA's / SJSA		Illumination		Utility Proximity	
Guards, Barriers		Warning Signs		Ground Protection		Confined Space	
Override		Variance		Surface Contamination Prevention	X	Energy Isolation	
Emergency Stops		MSDS (SDS)				Excavation	
Personal Hygiene	X						

NOTE: Make any site-specific notes to improve JSA quality, and document on additional job task page (Advise EHS if you have any questions or concerns) – All company employees have STOP WORK authority, and is expected that every employee will implement this policy in the event of any risk or hazard.

JSA Title:	Covid-19 Risk Assessment						
Step #	**Description of steps**	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person Initials**	**Mitigation on Steps**
1	**General Prevention Measures**	CB, CW, E, CC. Disease may be transmitted from carriers to other personnel. Disease may be transmitted from contact with contaminated surfaces. Disease may become airborne from sneezing or coughing. Disease may be transmitted by touching face or eyes after touching contaminated surfaces. Disease may be transmitted onto surfaces after being touched by, sneezed on, or coughed on by a contaminated person. *According to the CDC, the virus can last on surfaces for a period of time under certain conditions. These surfaces include metal, wood, plastics, stainless steel, cardboard, copper, aluminum, glass, ceramics and paper.*	8	• **IMPORTANT**: Before any employee mobilizes to a project site, or work area they must review the Company HASP, Exposure Control Plan (ECP) & ensure understanding with Center for Disease Control (CDC) Guidelines for COVID-19 risk identification & exposure control • Each employee must be fit for duty (see fit for duty policy). If you feel unwell or show signs or symptoms of COVID-19, do not come to work. Current CDC guidance is that if you have a temperature above 100.4 F [37.8 C], or in close contact with someone suspected of having COVID-19, then you must stay home. If you have an elevated temperature, do not come to work and contact your healthcare provider. • If experiencing signs or symptoms of COVID-19 infection, such as fever, dry cough, or other flu-like symptoms, do not report to work. If symptoms begin while at work, stop what you are doing immediately and contact your supervisor and personal Doctor. • Follow sanitization methods outlined by the (CDC) to ensure work areas have been disinfected correctly. • All employees that are sick with any illness and have not been tested for COVID-19 must not report to work and contact their manager by phone. • All employees that have been in contact with sick employees must be informed and removed from the work area immediately. • Social distancing measures, maintaining a 6' distance, must be followed • Avoid coughing or sneezing into hands. This should be done in your elbow & use Kleenex/covering to cover your mouth. • Avoid touching face and eyes before thoroughly washing hands or using hand sanitizer that contains at least 60% alcohol solution • All commonly used/touched surfaces must be treated as though they are contaminated. • All commonly used/touched surfaces must be regularly disinfected by a solution containing at least 60% alcohol. • All employees must be trained on PPE use and proper donn & doff procedures. (put on & removal) • The use of nitrile gloves is required, provided the employee is trained and proper donn & doff procedures. In addition, nitrile gloves must be sanitized before their removal, and hands must be washed or sanitized after nitrile gloves are removed. • Employees must enforce housekeeping measures to prevent cross contamination following sanitization methods outlined by the (CDC) This includes disposing of any materials that may have contacted their mouth, been coughed on, sneezed on or have expelled particulate matter on them.	2		

2	**Driving to and from site (Mobilization)**	CB, CW, E, CC. Disease may be transmitted from carriers to other personnel. Disease may be transmitted from contact with contaminated surfaces. Disease may become airborne from sneezing or coughing. Disease may be transmitted by touching face or eyes after touching contaminated surfaces. Disease may be transmitted onto surfaces after being touched by, sneezed on, or coughed on by a contaminated person. *According to the CDC, the virus can last on surfaces for a period of time under certain conditions. These surfaces include metal, wood, plastics, stainless steel, cardboard, copper, aluminum, glass, ceramics and paper.*	8	• Before any employee mobilizes to a project site, or work area, they must review the Company HASP, Exposure Control Plan (ECP) & ensure understanding with Center for Disease Control (CDC) Guidelines for COVID-19. • Follow sanitization methods outlined by the (CDC) to ensure vehicle has been disinfected correctly. • Ensure all employees are wearing required level D PPE, nitrile gloves under work gloves, and respiratory protection as needed, or required. (N95 face mask recommended) **NOTE**: *If N95 face masks are not available, then employees must follow Center for Disease Control (CDC) guidelines to ensure a compliant commercially manufactured & disposable medical face mask is worn, when working together, riding in close proximity or when social distancing is difficult to maintain.* • If needed PPE is not available, then employee has personal conveyance options to use own vehicle or other option approved by manager. • Clean & disinfect frequently touched surfaces every day. (or multiple times a day) • Wipe down exterior of truck prior to entering. • Ensure employees are fit for duty. (Make sure no symptoms or signs of any illness are visibly present) • Once exterior is wiped down ensure you wipe down the internal of vehicles prior to leaving. • Clean hands frequently, using an alcohol-based hand rub or soap, water and sanitizer. • Avoid touching your face, mouth or eyes • If employees are in close proximity, hands should be washed & gloves worn, before contact (employees should to wear a face mask or respirator if riding in the same vehicle) **PLEASE NOTE:** There are certain situations where an employee may take a separate vehicle or other vehicle approved by manager, and that will be managed on a case by case basis • **Vehicles:** sanitize vehicles before driving/sharing with others (steering wheels, shifters, buttons, controls, etc.) Follow sanitization methods outlined by the (CDC) to ensure vehicle has been disinfected correctly. • When making stops for gas, food, or breaks ensure to wipe exterior and interior when exiting or entering the truck as before mobilizing. • Do not bring unnecessary personal items from home to work, and never leave personal waste in vehicles (pop cans, water bottles, trash, chew cans, etc.) • Use caution when using public restrooms, portable toilets. Use paper towel as barrier when touching door handles & faucets • Wear gloves when refueling to avoid cross-contamination of germs • No hazardous or cross-contaminated material allowed in the vehicles & do not transport any clients, or other non-company workers, or civilians in company vehicles	2		

3	**General Field Work**	CB, CW, E, CC. Disease may be transmitted from carriers to other personnel. Disease may be transmitted from contact with contaminated surfaces. Disease may become airborne from sneezing or coughing. Disease may be transmitted by touching face or eyes after touching contaminated surfaces. Disease may be transmitted onto surfaces after being touched by, sneezed on, or coughed on by a contaminated person. *According to the CDC, the virus can last on surfaces for a period of time under certain conditions. These surfaces include metal, wood, plastics, stainless steel, cardboard, copper, aluminum, glass, ceramics and paper.*	8	• All company site workers, must have completely reviewed the company exposure control plan (ECP), along with the site-specific COVID-19 HASP & completed the required CBT (COVID-19) training, before arrival on site. (Badges should be worn by all crew members on site) • Non-essential workers, or visitors are not allowed on the project site. • Crew members must sign in/sign out & avoid congregating during breaks. (use separate vehicles during breaks or lunch) • Follow sanitization methods outlined by the (CDC) to ensure the common surfaces on the worksite have been disinfected. • Ensure all employees are wearing required level D PPE, nitrile gloves under work gloves, and respiratory protection as needed, or required. (N95 face mask recommended) **NOTE**: *If N95 face masks are not available, then employees must follow Center for Disease Control (CDC) guidelines to ensure a compliant commercially manufactured & disposable medical face mask is worn, when working together, riding in close proximity or when social distancing is difficult to maintain.* • Do not take public transportation, during the time you are practicing social distancing. Avoid crowded places and keep your distance from others (about 6 feet or 2 meters) • **REMINDER FOR SITE WORK:** This 6' distance is in addition to the jobsite exclusion zone that has been setup around the work area to delineate pedestrians or other people from entering the work area. Meaning that once work exclusion zone is setup, the crew must delineate an "additional 6 foot" zone around the work exclusion zone to comply with social distancing guidelines. (greatest distance is best) – Practice 6' social distance while working. • **SIGNAGE**: COVID-19 Signs utilized around the delineated work area. • Wipe down all equipment prior to entering rigs, skid steers, forklifts, or other pieces of equipment. • Wipe down all control panels, control handles – Wear nitriles when touching components such as, air hoist cranes, injection hoses, hand tools, etc., or other tooling/equipment. • Avoid lunch breaks together in one vehicle & use separate vehicles. (sanitize common area if taking lunch together in vehicle) • Avoid chewing tobacco, spitting & cigarettes – Eliminate hand/mouth contact & avoid spitting in work area where other employees could be impacted. • Sanitize portable restrooms surfaces and keep a supply of hand sanitizer in portable restroom. Only company employees should have access to the portable restroom on site. • Report any cold/allergy symptom to onsite personnel, before arrival to the site (Client & Company) – When symptoms or potential exposures are reported, prior to arriving on a project site the employee may be restricted from mobilization to the project site (*noted in section for reporting to work*) • Report ANY change in work conditions to Supervisor and document any abnormalities on site & that information will be used for investigative purposes. • **Cascade Card:** Company employees should be using the Cascade Card risk assessment tool to identify & mitigate any biological or hygiene related hazards that may be present.	2		

4	**Exposure at Hotels**	CB, CW, E, CC. Disease may be transmitted from carriers to other personnel. Disease may be transmitted from contact with contaminated surfaces. Disease may become airborne from sneezing or coughing. Disease may be transmitted by touching face or eyes after touching contaminated surfaces. Disease may be transmitted onto surfaces after being touched by, sneezed on, or coughed on by a contaminated person. *According to the CDC, the virus can last on surfaces for a period of time under certain conditions. These surfaces include metal, wood, plastics, stainless steel, cardboard, copper, aluminum, glass, ceramics and paper.*	8	• Follow all procedures in the company exposure control plan (ECP) & company COVID-19 HASP. • **IMPORTANT:** If employee is staying in a hotel, request information from the hotel on cleaning protocol & evaluate that based upon the Center for Disease Control (CDC) guidelines for cleaning an overnight hotel. Employee must follow up on any obtained information with their supervisor – This is to ensure the living space is in compliance & has been correctly disinfected for proper hygiene. (according to (CDC) guidelines) • Follow sanitization methods outlined by the (CDC) to ensure vehicle or any transportation device has been disinfected. • Employees are not allowed to share hotel rooms, and are required to have individual rooms. • If possible, employees should consider extended stay type hotels for longer stays to avoid checking in and out of different rooms. • Employees should upon immediately upon checking into their room, the employee shall sanitize room following sanitization methods outlined by the (CDC) to ensure the room has been disinfected. • Employees have authority to STOP WORK if they do not feel safe in any hotel & should contact their supervisor to make any changes to where they are staying or address any sanitary issues. • **NOTE**: *If N95 face masks are not available, then employees must follow Center for Disease Control (CDC) guidelines to ensure a compliant commercially manufactured & disposable medical face mask is worn, when working together, riding in close proximity or when social distancing is difficult to maintain.* • **This JSA applies to the 2019 Novel Coronavirus** (SARS-CoV-2) or the disease known as "COVID-19". The Centers for Disease Control and Prevention (CDC), World Health Organization, (WHO), Occupational Safety and Health Administration (OSHA), and other public health agencies are considering the outbreak of COVID-19 to be a pandemic. It is important that employees, contractors, and visitors take standard precautions recommended by CDC and OSHA, outlined in this JHA and the company health and safety plan (HASP). • For the most up to date information about COVID-19 visit the CDC COVID-19 webpage. • For OSHA's guidance related to Hazard Recognition regarding COVID-19 visit https://www.osha.gov/SLTC/covid-19/hazardrecognition.html.	2		

<table>
<tr><td>5</td><td>Office Work</td><td>CB, CW, E, CC. Disease may be transmitted from carriers to other personnel. Disease may be transmitted from contact with contaminated surfaces. Disease may become airborne from sneezing or coughing.

Disease may be transmitted by touching face or eyes after touching contaminated surfaces. Disease may be transmitted onto surfaces after being touched by, sneezed on, or coughed on by a contaminated person.

According to the CDC, the virus can last on surfaces for a period of time under certain conditions. These surfaces include metal, wood, plastics, stainless steel, cardboard, copper, aluminum, glass, ceramics and paper.</td><td>8</td><td>
Before any employee arrives to an office area, they must review the Company HASP, Exposure Control Plan (ECP) & ensure understanding with Center for Disease Control (CDC) Guidelines for COVID-19
Follow sanitization methods outlined by the (CDC) to ensure work areas have been disinfected
All employees that are sick with any illness and have not been tested COVID-19 must not report to work and contact their managers.
All employees that have been in contact with sick employees must be informed and removed from the work area immediately.
Social distancing measures, maintaining a 6’ distance, must be followed
COVID-19 exposure prevention signs must be placed at all entrances alerting vendors and employees that prevention measures are in place, and vendor traffic is limited.
Work desks must be placed a minimum of 6’ apart, and employees must maintain social distancing measures of 6’ while not at their desk or office area
Avoid having in-person meetings
Avoid eating or hanging out in common areas
Limit the use of shared items such as pens, clip boards, or any other objects used by more than one office personnel
If a vendor must enter the facility, limit the amount of personnel they have contact with, maintain social distancing while communicating with the vendor, and use separate pens for signing documents or receipts.
All packages received should be treated as though they are contaminated, and disinfected prior to handling or opening.
Avoid touching face and eyes before thoroughly washing hands or using hand sanitizer that contains at least 60% alcohol solution.
All commonly used/touched surfaces must be treated as though they are contaminated.
All commonly used/touched surfaces must be regularly disinfected by a solution containing at least 60% alcohol.
Employees must enforce housekeeping measures to prevent cross contamination following sanitization methods outlined by the (CDC) This includes disposing of any materials that may have contacted their mouth, or have been coughed or sneezed on or have expelled particulate matter on them
NOTE: <u>If N95 face masks are not available, then employees must follow Center for Disease Control (CDC) guidelines to ensure a compliant commercially manufactured & disposable medical face mask is worn, when working together, riding in close proximity or when social distancing is difficult to maintain</u>
</td><td>2</td><td></td><td></td></tr>
</table>

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Note: Risk score between 13-20 requires a JSA STOP WORK & work instruction prior to task		
Score	**Risk**	**Action**
1-5	**Low Risk**	**Continue to Monitor and Control**
6-12	**Moderate**	**Follow Procedure & Interim Controls must be used**
13-17	**Significant**	**Stop Work as needed. Interim Controls must be used**
18-20	**Extreme**	**Stop Work and control hazard before work resumes**

Additional Job Tasks

Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA <u>MUST</u> be posted on-site and be available to any employee upon request.

JSA DEBRIEF

REMINDER: If any employee notices anything needed that is currently not mentioned on the JSA, they must immediately bring it to the attention of their supervisor. That item or area of concern should be added to the JSA additional job tasks page, and the appropriate risk assessment and mitigations are to be discussed, approved to confirm they are applicable and then implemented by the crew

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:	
Date:	

CASCADE
DRILLING | TECHNICAL SERVICES

JOB SAFETY ANALYSIS

Vacuum Truck Operations & Air-Vac Bore Hole Clearance

JSA Prepared By: Operations Managers, Drillers, Supervisors, EHS Department	Date: 09/01/2019
JSA Approved By: EHS Department	JSA Number: VAC002
	Country: USA

Types of Hazards Anticipated:

Safety	Y	Safety	Y	Health	Y	Health	Y	Environmental	Y	Environmental	Y
Struck By (SB)	x	Fall to Below (FB)	x	Noise	x	Oxygen Deficiency		Heat Stress		Water Contaminations	x
Struck Against (SA)	x	Overexertion (OE)	x	Silica		Bloodborne pathogen		Cold Stress, Ice & Snow		Ground/Soil Contamination	x
Contact By (CB)	x	Exposure (E)	x	Asbestos		Musculo-skeletal	x	Wind		Release to Ground	x
Contact With (CW)	x	Electric Shock (ES)		Other Dust	x	Fauna (bears, snakes, etc)		Lightning			
Caught On (CO)	x			Hazardous Chemical		Insects (ticks, bees, spiders, etc)		Visibility (Fog)			
Caught In (CI)	x			Hydrogen Sulfide		Flora (poison ivy, etc)		Soil Stability	x		
Caught Between (CBT)	x			Carbon Monoxide				Habitat destruction	x		
Fall-same level (FS)	x			Methane				Air Contamination			

Type of PPE required if marked with 'X' (must be in accordance with CDLP PPE Program requirements):

Task Appropriate Gloves	Hearing Protection (min 25 dB)	ANSI Z89.1 Hard Hat	ANSI Z87.1 Safety Glasses	ASTM F2413 Steel Toe Boots, Metatarsal	ANSI High Vis Vest (or Outerwear)	Safety Goggles	Dust mask	APR	SCBA	Face shield / protective hood	Welding or Chemical protective suit	Fall protection
X	X	X	X	X	X					X		

Other PPE Required:

Other Controls required if marked with 'X':

Engineering Controls		Administrative Controls		Environmental Controls		Permits	
Interlock		Training	x	Ventilation	x	Hot Work	
Lockout / Tag Out	x	JSA's / SJSA	x	Illumination	x	Utility Proximity	
Guards, Barriers	x	Warning Signs		Ground Protection	x	Confined Space	
Override		Variance				Energy Isolation	
Emergency Stops	x	MSDS (SDS)	x			Excavation	
GFCI							

Notes: Make any site specific notes on SJSA form (Doc# SF-2.4, Revised 04/30/2014). Make notes to improve JSA quality here, and turn in copy to CDLP EHS.

JSA Title:		Vacuum Truck Operations & Air-Vac Bore Hole Clearance					
Step No: order	**Sequence of Job Steps** Break down Job into steps.	**Potential Hazards & Impacts** Identify hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** pre action	**Procedure or action required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies	**Risk Rating** post action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**
1	Bore hole clearance (see Chevron requirement at Step 5).	Fall - Slips, trips and falls due to hoses on ground, holes, uneven ground, open trenches, and excavations	8	• Employee awareness and minimizing tripping hazards • Stow hoses under rig or put away when not in use • Never step on hoses always use side step technique • Be careful of open holes while moving hoses • Cover open hole w/ cone, plate, or other marker if left unattended.	3		
		Exposure to noise		• Wear hearing protection			
		Exposure to build-up of flammable and/or toxic vapors		• Conduct frequent air monitoring (by client) to assess need for Level C protection. • Use vacuum to remove debris and vapors. • Additional fans and/or ventilation may be required. • Inspect Vac filters, ensure they are clean and in proper working order.			
		Exposure to fire caused by electrical malfunction or static		• Inspect cable and flood light for frays, cracks, and other damage. • Do not operate vacuum truck within 15 feet of any flammable vapors (critical zone.) Provide enough hose so that truck & equipment can remain outside the area. • Grounding strap must touch ground			
		Exposure to flying debris and soil		• Face shield must be down when operating air lance • Clean off faceshield when needed • Non-essential personnel must be minimum of 15 feet away • Use cone, or device to contain flying debris			

		Contact with subsurface structures including underground utilities, tanks, etc.		• Borehole must be located a safe distance from utility locate markings. Outer edge of borehole should be 5 feet away from any locates but no closer than 3 ft. • Vac. holes will be 120% larger in diameter than OD of auger/tooling/bit. • Use floodlight to look for utilities and other objects every 3 to 4 inches. • Air-lance will not be used as a probing tool or jabbed into the hole. Use air only to loosen soils. • When air pressure has met refusal, the client will be consulted for instructions whether or not to use high pressure water or other tools. • If pea gravel, fabric or non-native material is discovered the client must be informed. Operations will not continue until directed by primary contractor. • Metal probing devices such as rock bars, shovels, and post hole diggers should not be used, unless client deems it necessary.			
		Contact with air lance and suction hose doing damage when not in operations		• Make sure lance and vac. hose valves are in the off position before putting them down. • Air knife should be shut off at the supply at the back of the rig when air knife is not in use to prevent accidental opening in the event of wand falling.			
		Exertion - back strain		• Stretch before lifting • Use “Safety In Motion” Training • Get assistance with heavy (>50 lbs.) or awkward objects • Use appropriate tools such as booms, etc.			
2	Clearing obstruction from vacuum hose	**Contact** with hammer	5	• Hammers/mallets used to clear obstructions from clogged vacuum hoses must have a tether to secure to the helper’s wrist. • Consider the line of fire of the hammer/mallet before striking, and be sure co-workers/by-standers will not be struck; strike downward, away from people.	3		
		Contact by debris not making it into drum causing damage or injury		• Do not throw debris into drum • Use a bucket to collect debris and pour into drum or walk over to drum and drop it in • Never throw anything • Use buddy system when necessary			

3	Backfill borehole	**Contact** to persons or object when backing-up truck	8	• Inspect area to be backed into – check overhead clearance • Use spotter to back truck – discuss backing location objective, signals to be used, where the spotter will stand, and to stop backing if anyone enters or approaches the backing field. • STOP if you lose site of the spotter • Vacuum truck should be equipped with a back-up alarm or use horn while backing • Make sure all PPE is being used to include reflective vests	3		
		Contact by being struck by dump hatch		• Turn on vac suction before you loosen wing nuts (if system purges hatch may blow open) • "**DO NOT SHAKE TANK**" (do not use rapid up/down movement of tank) to loosen or remove spoils from tank			
		Exposure to overhead by elevated truck bed		• Double check overhead clearance before dumping • Stay away from moving parts • Keep a **minimum** of 15 feet from overhead power lines (20 ft. if 230, 285 kv / 25 ft. if 345 kv / 35 ft if 500 kv) Check with utility company if in doubt			
		Contact - Engulfment by soil		• Raise tank bed slowly and carefully. • Never reach into tank, use long handled tool to pull soil to opening. • Beware rocks rolling, bouncing out of tank.			
4	Tamper backfill material	Strain – back and shoulder	5	• Keep shoulders and body in line over tamper, keep elbows close in to body. • Rotate task w/ another worker.	3		
		CW – foot, body		• Keep eyes on task and feet shoulder width apart.			
		CW – uncontrolled tool		• Use right tool for the job, avoid striking side of hole w/ tool. • Rotate body around perimeter as you compact soil/asphalt			
		CW – splinter from handle		• Inspect equipment prior to use and remove old/worn equipment from service. • Wear task appropriate gloves.			

5	**CHEVRON REQUIREMENT – this step is a requirement on Chevron sites only:** <u>Grounding & Bonding</u>		• Vac Truck must be equipped with Grounding strap and Bonding equipment. • Conduct air monitoring using a multi-gas meter per HASP (client will do this) • Hoses must be conductive when transferring flammable liquids. This is verified with an electrical tester by touching tester to the metal hose end and connection. Ensure metal hose end is not touching the ground during testing. • Grounding systems must demonstrate a resistance of less than 25 ohms using an Earth Ground Resistance testing meter. Note: Ohm meters are not sufficient for verification of ground rods. Alternatively, vac truck equipment may be equipped with a Mobile Ground Verification System. • Since you are using a grounding plate, just clamp your wire clip onto the plate. Note for Operator: Please make sure you talk to Operations about how the grounding plate will be installed in the ground and include the grounding plate in the ground disturbance process.			

Severity	Employee Injury	Environmental Damage	Property/Equipment Damage	Reputation Impact	Not Likely (Low)	Unlikely (Moderate)	Reasonably Likely	Highly Likely
	First Aid Treatment	Minor Impact on Environment	Negligible damage to Property, System or Equipment (under $1,000)	Internal Cascade Drilling LP impact only	1	2	4	7
	Requires Medical Treatment	Severe impact on environmental but easy rectified	Minor damage to Property, System or Equipment ($1,000-$5,000)	Local site impact involving Cascade Drilling LP and Cascade Drilling LP Contractors. Managed internally	3	5	8	12
	Severe injury - Fractures, Lost time injury or less than or equal to 7 days	Severe impact on environment requiring significant time to rectify	Medium level damage to Property, System or Equipment ($5,000 - $15,000)	Cascade Drilling LP Client impact on local site. Managed in coordination with Client	6	9	11	16
	Major Injury - Lost time injury more than 7 days	Major but repairable damage to the environment	Extensive Damage to Property, System or Equipment ($15,000 - $50,000)	Cascade Drilling LP Client impact on multiple sites. Incident response controlled by client. Operations closed by Client. Potential loss of Contract	10	13	17	18
	Fatality - Permanent Disability	Permanent & Irreparable Damage to Environment	Loss of major or Business critical Property, System or Equipment ($50,000 +)	National Media involved. Client impact. Loss of current Contract	14	15	19	20

Score	Risk	Action
1-5	Low Risk	Continue to Monitor and Control
6-12	Moderate	Follow Procedure & Interim Controls can be used
13-17	Significant	Stop Work as needed. Interim Controls must be used
18-20	Extreme	Stop Work and Control Hazard before work resumes

Note: Risk score between 13-20 requires a JSA or Work Instruction prior to commencement of job

Additional Job Tasks

Step No: Order	**Sequence of Job Steps** Break Down Job Into Steps	**Potential Hazards & Impacts** Identify Hazards faced at each step of the task. Identify what may happen if the hazard is not effectively controlled.	**Risk Rating** per Action	**Procedure or Action Required** Determine the actions necessary to reduce risk to an acceptable level. Record responsibility for the action as applies.	**Risk Rating** Post Action	**Responsible Person(s) - Initials**	**Mitigation on Steps Verified**

EMPLOYEE NAMES:	EMPLOYEE SIGNATURES:	DATE:

A signed copy of this JSA MUST be posted on-site and be available to any employee upon request.

JSA DEBRIEF

DATE & TIME	Participants	What Went Well	Lessons Learned

Name of Person filling out form:
Date:

APPENDIX C
Applicable Safety Data Sheets

For additional Safety Data Sheets not included in this HASP, scan QR Code below to access CASCADE's online SDS Library

Attachment I

Project Emergency Response Plan

Attachment I: Project Emergency Response Plan

Please complete the Project Emergency Response Plan, which can be found at the following location:

- https://myecosystem.aecom.com/ppf/forms/Forms/S3NA_010_FM2_A%20Short%20Visit%20ERP.dotm

AECOM

Attachment J

Project Hazardous Materials Communication Plan

Attachment J: Project Hazardous Materials Communication Plan

Materials to be brought or encountered onsite will have a Safety Data Sheet (SDS) maintained in an accessible location for workers to review. Applicable SDSs are presented in **Attachment G**. Materials to be brought or encountered onsite will include:

- XXXXX.
- XXXXX.
- XXXXX.

As part of the Site Safety Officer (SSO) daily activities, an inventory of hazardous materials will be prepared with the quantities expected to be on site. The inventory will be updated if any additional materials are brought on site and as frequently as necessary to reflect accurate quantities. This chemical inventory list will be readily available for review (usually kept with the SDSs).

Unless each container has appropriate labeling, all chemical containers will be labeled with the following information:

- Product name and identity of the hazardous chemical(s).
- Appropriate hazard warnings.
- Name and address of the chemical manufacturer, importer, or other responsible party.

Labels on incoming containers of hazardous materials will not be removed or defaced. Labels are also required when a hazardous substance is transferred from a primary container to a secondary container. Labels on secondary containers must indicate the product name or the names of the hazardous substances contained therein as well as related physical and health hazards and their associated target organs. Labels may incorporate words, pictures, symbols, or combinations thereof to ensure the appropriate information is provided to the end user.

Examples of acceptable labeling systems include the National Fire Protection Association Diamond, the Hazardous Materials Identification System, the Chemical Hazard Identification and Training system, or similar.

Employee requirements for reviewing SDSs for specific safety and health protection procedures are presented below.

- AHAs will incorporate information contained in the SDSs.
- SDS information will be followed in the use and disposal of material and selection of hazard control and emergency response measures.
- The SSO will obtain an SDS for each chemical before it is used. SDSs will generally be received by the person ordering the product. SDSs for products frequently used should be kept on file because additional copies may not be included in repeat shipments.
- The SSO will review each SDS when it is received to evaluate whether the information is complete and to determine whether existing protective measures are adequate.
- The SSO will maintain a collection of all applicable and relevant SDSs in an area that is accessible to all employees at all times. An electronic database is an acceptable method of maintaining the SDSs.
- The SSO will replace SDSs when updated sheets are received and will communicate any significant changes to those who work with the chemical.
- SDSs are required for all hazardous materials brought on site by project personnel.

General household products to be used for their specific purpose, food, drugs, and cosmetics brought into the workplace for employee use and consumption are all exempt, as are supplies in the first-aid kit, such as isopropyl alcohol and antibacterial wipes.

Employees bringing hazardous materials on to a site or project must submit SDSs to the SSO. The SSO may restrict the use of certain hazardous materials on a site or project due to occupational health risk, hazardous physical properties of the material, or potential employee sensitivity to odor or irritating properties of the material.

Other personnel working in the same area shall be provided with the following information on chemicals used by or provided to AECOM personnel:

- Names of hazardous chemicals to which they may be exposed while on the jobsite.
- Precautions the employees may take to lessen the possibility of exposure by usage of appropriate protective measures, such as ventilation or isolation of the work. In some cases, as an administrative control measure, a task may be delayed to a time when a minimal number of employees are present in the area.
- Location of SDSs.

As discussed in Section 5.1 of the HASP, employees will be trained initially and periodically when use of hazardous or toxic agents is altered or modified to accommodate changing on-site work procedures. Training shall cover the following topics:

- Requirements and use of the hazard communications program on the project.
- The location of all hazardous or toxic agents at the project.
- Identification and recognition of hazardous or toxic agents on the project.
- Physical and health hazards of the hazardous or toxic agents pertinent to project activities.
- Protective measures employees can implement when working with project-specific hazardous or toxic agents.

Provide training to all employees who have the potential to be exposed to hazardous materials: a) at the time of the initial task assignment, b) whenever new chemicals are introduced into the workplace, and c) more frequently where required by site-specific conditions or client-specific requirements. This training will include the following:

- Applicable regulatory requirements.
- Location of the program, inventory, and SDS.
- Site-specific chemicals used and their hazards (chemical, physical, and health), including the general characteristics of the chemicals and signs and symptoms of exposure.
- How to detect the presence or release of chemicals including the location, types, and usage of any portable and fixed monitoring or detection equipment and their associated alarms, where applicable.
- Safe work practices (S3AM-001-PR1) and methods employees can take to protect themselves from chemical hazards (metals or explosives constituents in soil).
- How to read an SDS.
- Site- or project-specific information on hazard warnings and labels in use at the location, if applicable.
- Site-specific evacuation and rescue procedures in the event of chemical release, including the location of staging areas and personnel accounting procedures.

The following documentation will be maintained in the project file:

- Chemical inventory list;
- SDSs; and
- Training records.

Attachment K

AECOM SH&E Policy

Attachment K: AECOM SH&E Policy

Safety, Health & Environment

Purpose

This policy establishes the framework to safeguard AECOM's employees and stakeholders through effective management of risk and commitment to a Culture of Caring.

Commitment

In recognition of the right to a safe and healthy working environment, AECOM is committed to maintaining the physical, psychological, and social well-being, of our employees, stakeholders, and global communities through appropriate risk management strategies.

To advance our Safety, Health & Environment (SH&E) program, we are committed to:

- Our goal of Zero work-related injuries to AECOM employees and stakeholders, incident prevention and protection of the environment while executing our work.
- Providing a highly effective SH&E management system based on our Life-Preserving Principles that empowers employees and drives continuous review and improvement opportunities.
- Effectively managing critical SH&E risk throughout the project lifecycle, through identification and development of suitable actions using the hierarchy of controls.
- Appropriately meeting client requirements and properly incorporating all applicable SH&E legal requirements and local, state, provincial and national regulations.
- Fostering an exceptional safety culture based on communication, collaboration, and consultation, where our people and stakeholders embrace ownership for the well-being of themselves and others.
- Advancing our goals of pollution prevention, resource conservation and environmental sustainability as set out in the Sustainable Legacies strategy.
- Setting aggressive SH&E performance goals and Core Value Metrics; working with employees and business partners to meet targets and promote continuous improvement opportunities.
- Establishing AECOM as the global provider of choice through safe execution of professional services throughout the project lifecycle.

Participation

Individual ownership of our Safety for Life program is required through participation of all parties in our Culture of Caring.

To that end, we expect our leaders, managers, supervisors, employees, and subcontractors to:

- Commit to the well-being of themselves and of all other stakeholders both on and off the job.
- Demonstrate this commitment through compliance with applicable rules and properly identifying, managing and eliminating hazards and reducing risk in the workplace.
- Engage in planning and training to enable competency and the proper and appropriately maintained equipment, materials, and personal protective equipment required to work safely and respond as necessary to emergencies.
- Take action to stop work if the work cannot be executed safely or if conditions or behaviors on the work activity are unsafe or unhealthy.
- Immediately report SH&E incidents, near-misses, unsafe conditions, and at-risk behaviors; participate in investigations and review findings with appropriate stakeholders to enable implementation of corrective and preventative actions.

Accountability

We expect continuous improvement in our journey toward a "zero" incident culture, where everyone participates and is committed to SH&E excellence.

To that end our leaders, managers, supervisors, employees, and subcontractors will be held accountable to their commitment and participation through:

- Recognition and reward of those who positively contribute to excellent SH&E performance.
- Inspections, investigations and reporting to assess SH&E management system application; elevation of high potential findings to senior and executive leadership to enable appropriate action.
- Appropriate action such as coaching or disciplinary measures when expectations are not met.

Review and Communication

This Policy and associated SH&E management system will be reviewed annually and will be made available to all persons under the control of the company.

	September 3, 2021
Troy Rudd **Chief Executive Officer**	**Date**

AECOM

Attachment L

Competent Person Designation

Attachment L: Competent Person Designation

Activity / Area of Competency	Name of Person (Affiliation) Note: Subcontractor may provide this person
☐ Asbestos	
☐ Assured Equipment Grounding Conductor	
☐ Blasting & Explosives	
☐ Concrete & Masonry Construction	
☐ Confined Spaces	
☐ Control of Hazardous Energy (Lockout-Tagout)	
☐ Crane Assembly / Disassembly	
☐ Cranes & Derricks	
☐ Demolition	
☐ Electrical Wiring Design & Protections	
☐ Elevated Work Platforms & Aerial Lifts	
☐ Fall Protection	
☐ Hearing Protection	
☐ Heavy Equipment	
☐ Ionizing Radiation	
☐ Lead	
☐ Material Hoists & Personnel Hoists	
☐ Respiratory Protection	
☐ Rigging Equipment	
☐ Scaffolds	
☐ Stairways & Ladders	
☐ Steel Erection	
☐ Trench & Excavations	
☐ Underground Construction	
☐ Welding & Cutting	

Appendix L

Summary of Green Remediation Metrics

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 Period	**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 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		

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**