Former Mugler Shoring Inc.

BRONX COUNTY

BRONX, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: C203052

Prepared for:

BOP 2401 Third Avenue, LLC

250 Vesey Street, 15th Floor, New York, NY 10007

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.

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631-232-2600

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

DECEMBER 2020

CERTIFICATION STATEMENT

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

_____P.E.

NYS Professional Engineer #072491

December 10, 2020
_____DATE

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List of Acronyms

AS	Air Sparging
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
EWP	Excavation Work Plan
GHG	Green House Gas
GWE&T	Groundwater Extraction and Treatment
HASP	Health and Safety Plan
IC	Institutional Control
NYCDOHMH	New York City Department of Health and Mental Hygiene
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines

SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank

ES EXECUTIVE SUMMARY

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

Site Identification:	C203052 Former Mugler Shoring Inc. 2401 Third Avenue, Bronx, New York
Institutional Controls:	1. The property may be used for restricted residential, commercial, and/or industrial use;
	2. All ECs must be operated and maintained as specified in this SMP.
	3. All ECs 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 NYCDOHM 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 this SMP.
	6. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP.
	7. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP.
	8. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.
	9. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this 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 the Environmental Easement.	
	11. The potential for vapor intrusion must be evaluated for any future buildings (excluding the building currently under construction at the time this SMP was issued) developed in the area within the IC boundaries noted on the Survey (Appendix A), and any potential impacts that are identified must be monitored or mitigated.	
	12. Vegetable gardens and farming on the Site are prohibited.	
Engineering Controls:	1. Cover system	
Inspections:		Frequency
1. Cover System Inspection		Annually
Reporting:		
1. Periodic Review Report		Annually until completion and documentation of all development-related construction, then every 3 years thereafter.

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

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Former Mugler Shoring Inc. Site located at 2401 Third Avenue ,Bronx, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP)Site No. C203052, which is administered by New York State Department of Environmental Conservation (NYSDEC).

On September 9, 2015, 2401 3rd Ave Associates Property, LLC entered into a Brownfield Cleanup Agreement (BCA)with the NYSDEC to remediate the Site. On September 5, 2018, BOP 2401 Third Avenue, LLC purchased the Site. An application to amend the BCP agreement was approved on May 25, 2018 to include a change in ownership from 2401 3rd Ave Associates Property, LLC (Prior Volunteer) to BOP 2401 Third Avenue, LLC (Volunteer). Roux was retained by the Volunteer to serve as the consultant for the Site in September 2018. A figure showing the Site location and boundaries of this Site is provided in Figure 1. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A.

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

This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the

grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the Site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA (Index #C203052-06-15, Site #C203052) for the Site, and thereby subject to applicable penalties.

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

This SMP was prepared by Roux Environmental Engineering and Geology, D.P.C., on behalf of BOP 2401 Third Avenue, LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 3, 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and ECs that are required by the Environmental Easement for the Site.

1.2 Revisions

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

1.3 Notifications

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

- 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 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).
- Notice within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

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

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

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

Table 1: Notifications*

Name	Contact Information
Mandy Yau, NYSDEC Project Manager	718-482-4897 mandy.yau@dec.ny.gov
Jane O'Connell, NYSDEC Regional HW Engineer	718-482-4599 jane.oconnell@dec.ny.gov
Kelly Lewandowski, NYSDEC Site Control	518-402-4569 Kelly.lewandowski@dec.ny.gov
Steven Berninger, NYSDOH	518-402-7860 Steven.berninger@health.ny.gov

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

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIALACTIONS

2.1 Site Location and Description

The Site is located in Bronx County, New York and is identified as Block 2319and Lot 2 on the New York City and Borough of the Bronx Tax Map (see Figure 2). The Site is 1.378-acres and is bounded by a commercial property to the north, Third Avenue to the south/southeast, multiple commercial and industrial/manufacturing properties to the east, and the Harlem River to the west/southwest. The boundaries of the site are more fully described in Appendix A –Environmental Easement. The owner of the Site parcel at the time of issuance of this SMP is: BOP 2401 Third Avenue, LLC.

2.2 Physical Setting

2.2.1 Land Use

The Site is currently undergoing construction of a new building with three towers that reach 19 to 28 stories. Portions of the building include below-grade parking and maintenance areas. The future use of the redevelopment will consist of residential space, a portion of which will be affordable housing units. The building currently under construction at the time this SMP was issued has an overall footprint of 18,716 square feet (sq ft). Redevelopment at the Site also includes a new public promenade along the shoreline of the Harlem River. The Site is zoned M3/R8 for manufacturing and residential.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial, manufacturing, and residential properties.

2.2.2 Geology

The bedrock geology at the property and in the immediate vicinity consists of Inwood Marble of Lower Ordovician to Lower Cambrian Age with steep westerly dip of its upper surface. The depth to bedrock is approximately 39 to 95 feet below land surface (ft bls).

Bedrock is overlain by an unconsolidated overburden of an unsorted heterogeneous mix of Pleistocene and recent glacial material (i.e., glacial till) including clay, silt, sands, gravel, cobbles, and boulders. This overburden is overlain by historic urban fill which is observed from 5 to 14 ft bls.

Site specific boring logs are provided in Appendix C.

2.2.3 Hydrogeology

Groundwater at the Site is present under water table conditions at a depth of 5.65 to 9.73ft bls (Elevation 1.91 to -3.93 ft NAVD 88), based on a gauging event of three onsite monitoring wells completed on January 25, 2019. Based upon onsite measurements, groundwater flows to the northwest, toward the Harlem River, and may be influenced by tidal fluctuations. A groundwater contour map is shown in Figure 3. Groundwater elevation data is provided in Table 2. Groundwater monitoring well construction logs are provided in Appendix C.

2.3 Investigation and Remedial History

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

- Phase I Environmental Site Assessment (ESA)/Phase II ESA - Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. (Langan), October 28, 2014
- Remedial Investigation Report (RIR) – Environmental Business Consultants (EBC), February 2016
- Remedial Action Work Pan (RAWP)–Environmental Business Consultants (EBC), August 2016
- Endpoint Sampling Plan – Roux, November 16, 2018

2.3.1 Phase I/Phase II ESA – Langan, October 28, 2014

Prior to the submittal of the BCP application, a Phase I and Phase II ESA were completed for the Site by Langan. The Phase I ESA was completed in August 2014 and revealed the potential for soil, groundwater, and soil vapor contamination onsite due to two recognized environmental concerns (RECs), including current and historical manufacturing and industrial use and the presence of onsite petroleum bulk storage. As summarized in the Phase I ESA report, current and historical operations onsite included manufacturing processes which present potential for inadvertent releases of solvents, petroleum products, metals, polychlorinated biphenyls (PCBs) and/or other chemicals used during manufacturing operations. The Phase I ESA also identified three areas where historical underground storage tanks (USTs) were known or suspected to be present which were also listed as a REC.

The Phase II ESA completed by Langan in October 2014 investigated the Site based upon the findings of the Phase I ESA. The Phase II ESA included sampling of soil, groundwater, and soil vapor. A geophysical survey was completed as a portion of the Phase II ESA that revealed three geophysical anomalies, two of which were indicative of USTs located approximately 2 to 3 ft bls. The Phase II ESA confirmed the presence of a layer of historic fill throughout the Site ranging from approximately 5 to 13 ft bls. Analytical results confirmed the presence of NYSDEC Part 375 Unrestricted Use Soil Cleanup Standards (UUSCOs) exceedances in soil for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and PCBs. One of the soil borings, installed next to one of the geophysical anomalies, was suspected to be a 550-gallon gasoline UST that was reportedly decommissioned in 1999. Petroleum-like odors and photoionization detector (PID) readings (up to 700 ppm) were observed in the soil boring at depths of approximately 8 to 9 ft bls. Groundwater analytical sampling results from this location confirmed the presence of a petroleum release. This was reported as an open spill to the NYSDEC on August 13, 2014 and Spill Case No. 1405230 was assigned. The Phase II groundwater samples exceeded NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs) for VOCs, SVOCs, and metals. Soil vapor analytical results were compared to the New York State Department of Health (NYSDOH) Soil Vapor/Indoor Air Decision

Matrices for applicable VOCs. The VOC concentrations were below the sub-slab vapor concentration for the no further action threshold for all matrices.

2.3.2 Remedial Investigation Report – EBC, February 2016

In February 2016, EBC completed a Remedial Investigation (RI) to characterize soil, groundwater, and soil vapor to further investigate the RECs identified in the Langan Phase I and Phase II ESA, including the three locations of suspect USTs. Soil analytical results from the RI identified petroleum related contaminants in soil to a depth of 8 feet in the vicinity of a suspect 550-gallon UST that was reported in the Phase I ESA as previously decommissioned and is associated with Spill Case No. 1405230. Additionally, historic fill material has been identified across the Site to depths up to 7 ft bls. Soil analytical data yielded exceedances of UUSCOs for VOCs, SVOCs, metals, PCBs, and pesticides. Exceedances of Restricted Residential Soil Cleanup Objectives (RRSCOs) were limited to SVOCs, specifically polycyclic aromatic hydrocarbons (PAHs) and metals. Groundwater analytical results exceeded AWQSGVs for VOCs, SVOCs, metals, and PCBs. Groundwater samples collected from monitoring wells downgradient of the three suspect UST locations did not yield analytical data exceeding AWQSGVs for petroleum-related VOCs. With the exception of lighter compounds such as heptane and hexane in several samples, total petroleum-related VOCs were generally low in soil vapor samples across the Site. There did not appear to be any correlation in concentration or distribution of petroleum-related VOCs in soil vapor with the potential source areas associated with the suspect USTs. Chlorinated volatiles organic compounds (CVOCs) were also generally low.

2.3.3 Remedial Action Work Plan – EBC, August 2016

The RAWP, dated August 2016, was approved by NYSDEC in October 2016. The RAWP discussed a Track 4 Restricted Residential cleanup. The remedy for the Site, as outlined in the RAWP, includes removal of existing USTs; excavation of petroleum-impacted soil to a depth of approximately 9 ft bls; excavation and disposal of historic fill soil from the building foundation areas; and capping of the Site where soil remains above RRSCOs with the building foundations, concrete walkways/driveways or 2 ft of soil meeting RRSCOs.

2.3.4 Endpoint Sampling Plan – Roux, November 16, 2018

Prior to the start of excavation for remediation, the Endpoint Sampling Plan (ESP), dated November 16, 2018, was submitted to NYSDEC. The ESP outlined a field investigation and collection of the UST source area endpoint samples that were required in the NYSDEC-approved RAWP. The ESP also included the investigation of anomalies that were observed during the ground penetrating radar (GPR) survey that was completed in August 18, 2018. The ESP was approved by NYSDEC on December 11, 2018.

ESP Implementation

The ESP was implemented from January 7, 2019 through February 4, 2019. A total of 17 soil borings were completed and 14 endpoint samples were collected. Soil from each boring was inspected for evidence of impacts and screened for organic vapors using a PID. Soil lithology was recorded according to the Unified Soil Classification System (USCS). All samples were collected in appropriate laboratory-provided containers in ice-filled coolers under chain of custody procedures and transported to TestAmerica Laboratories in Edison, New Jersey, a National Environmental Laboratory Approval Program (NELAP) accredited-laboratory. As required by the RAWP, all soil samples were analyzed for:

- Part 375 VOCs via Method 8260C; and
- PAHs via Method 8270C.

Non-native clean backfill was observed at borings RXSB-1 at 7 to 11 ft bls, RXSB-3 at 8 to 10 ft bls, and RXSB-5 at 2 to 5 ft bls, potentially associated with a former tank pull and backfill. A tank was not observed at suspect UST No. 2 pre-clearance location; however, piping associated with the adjacent fill port was observed. During pre-clearance directly adjacent to fill port, piping was observed that ran vertically into concrete at approximately 6 ft bls. Additionally, the piping elbowed off approximately 3 ft bls and ran west. The extent of the horizontal piping was not uncovered due to onsite debris piles that limited access. Further investigation of fill port piping was addressed during the construction phase, further discussed below.

Generally, soil consisted of historic fill to depths ranging from 5 to 15 ft bls, underlain by sand and clay. Odor and staining were observed at the water table at boring locations

RXSB-4, RXSB-5, RXSB-6, and RXSB-7, all associated with suspect UST No. 2. Step-out locations (RXSB-4-N, RXSB-4-S, RXSB-5-N, RXSB-6-W, and RXSB-7-W) were completed in surrounding areas where odor and staining were observed, and samples were placed on hold pending the results of the initial samples. There was no odor or staining observed in soil at any of the step-out boring locations.

Monitoring Well Installation

Three monitoring wells were installed and sampled for emerging contaminants in support of a mandatory State-wide evaluation. During installation, the monitoring well soil borings were extended to the water table, which was observed at approximately 7 ft bls. Monitoring wells were constructed with 10 feet of 2-inch diameter, 0.02-inch slot polyvinyl chloride (PVC) screen to straddle the water table. All monitoring wells were developed following installation and with a minimum of one week between well development and sampling, to ensure a proper hydraulic connection.

Groundwater was sampled in accordance with the April 2018 NYSDEC guidance titled "Groundwater Sampling for Emerging Contaminants" (the current guidance at the time of sampling). Groundwater sampling was completed at a low-flow rate to minimize drawdown, and field parameters (e.g., pH, temperature, turbidity, conductivity, etc.) were collected concurrently. Once drawdown and these parameters stabilized, a groundwater sample was collected for laboratory analysis of emerging contaminants.

Work Plan Deviations

The relocation of boring RXSB-8 was approved by NYSDEC via e-mail on January 15, 2019. Based on field observations, the initial location of this boring was in an area of disturbed soil from a recent geotechnical test pit and would therefore not be a true representation of Site conditions. RXSB-8 was relocated approximately 20 ft southeast of the proposed location.

The relocation of monitoring well RXMW-2 was approved by NYSDEC via e-mail on January 16, 2018. Roux requested relocation of RXMW-2, in order to better capture

groundwater quality downgradient of the suspect USTs. RXMW-2 was relocated approximately 40 ft southeast of the proposed location.

During drilling for RXMW-2 monitoring well installation, staining and odor was observed from 8 to 16.5 ft bls. Refusal was encountered at 16.5 ft bls. Although a soil sample at RXMW-2 was not included as part of this scope of work, two soil samples were collected from 7-9 ft bls and 13-15 ft bls to be analyzed for VOCs and PAHs.

Soil Results

Soil analytical results and laboratory reports were provided to NYSDEC in the monthly progress reports and will also be included in the Final Engineering Report, which will be submitted after the approval of this SMP. There were no exceedances of RRSCOs in any soil samples associated with suspect UST endpoint sampling. Based on these results, step-out soil samples that were placed on hold were not run for analysis.

There was one soil exceedance of RRSCO at RXMW-2 (7-9 ft bls) for benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene. Soil sample RXMW-2 (7-9) did not exceed Protection of Groundwater Soil Cleanup Objectives (PGWSCOs) for these compounds. The deeper sample collected at RXMW-2 (13-15 ft bls) did not yield any exceedances. The exceedances of PAHs at RXMW-2 are indicative of fill material, and do not represent a source of contamination to groundwater.

Groundwater Results

Groundwater analytical results and laboratory reports were provided to NYSDEC in the monthly progress reports and will also be included in the Final Engineering Report. Groundwater was analyzed for emerging contaminants in monitoring wells RXMW-1, RXMW-2, and RXMW-3. A summary of the groundwater detections for emerging contaminants is provided in the below table:

Analyte	NYSDEC AWQSGVs (ng/L)	Detections above NYSDEC AWQSGVs	Range in Concentration Detections (ng/L)	Sample with Maximum Detection
1H,1H,2H,2H-Perfluorooctane Sulfonate	--	--	12.6 J	RXMW-1
Perfluorobutanesulfonic acid	--	--	1.19 J – 3.44 J	RXMW-3
PFBA	--	--	8.19 J – 11.3	RXMW-1
PFHpA	--	--	1.97 – 12.8	RXMW-3
Perfluorohexanesulfonic acid	--	--	1.23 JT – 1.56 JT	RXMW-2
PFHxA	--	--	4.46 – 12.8	RXMW-3
Perfluorononanoic acid	--	--	0.33 J – 1.11 J	RXMW-1
Perfluorooctane sulfonic acid	--	--	2.24 – 6.83	RXMW-1
PFOA	--	--	2.33 – 85.3	RXMW-3
PFPeA	--	--	1.27 J – 10.1	RXMW-3
1,4-Dioxane	--	--	0.12 J[1]	RXMW-1

1. 1,4-Dioxane results reported in ug/L

2.3.5 Remedial History

2.3.5.1 UST Source Area Excavation

The UST source areas are designated as UST No.1, UST No.2, and UST No. 4, as shown in Figure 2. During excavation for Site redevelopment, the UST source areas were marked out by a NYS-licensed surveyor and prior to excavation for offsite disposal. Additionally, a steel sheeting support of excavation (SOE) was installed along the border of the Site and the Harlem River, in order to facilitate excavation and remediation of the UST source areas. There were no USTs observed at locations UST No. 1 or UST No. 4 and soil was excavated to the endpoint sample locations collected during the ESP and disposed of offsite, which met RRSCOs. Additionally, there was no evidence of petroleum impacts (odor, staining, or elevation PID readings) observed at UST No. 1 or UST No. 4. During excavation at UST No. 2 on August 15, 2019, a 275-gallon UST was uncovered. The UST was uncovered by Kingdom (foundation contractor) and soil surrounding the UST was placed on and covered with poly-sheeting, in preparation for offsite disposal. An FDNY-licensed tank removal company, Innovative Recycling Technologies (Innovative), was contracted and mobilized to the Site on August 16, 2019. Innovative cut open the tank to reveal that the UST had previously been pumped and filled with concrete. Innovative broke up concrete,

cleaned the bottom of the tank, and generated one 55-gallon drum of tank bottoms. The tank was taken offsite by Innovative to be disposed of as scrap metal.

During excavation for the building's foundation and not associated with a pre-determined UST source as outlined in the NYSDEC-approved RAWP, a 550-gallon UST was uncovered by Kingdom while excavating in Grid C (0-2.5) and Grid C (2.5-5) on September 11, 2019. This excavation area is designated as UST-5 on Figure 2. The soil surrounding the UST was placed on and covered with poly-sheeting, in preparation for offsite disposal. An FDNY-licensed tank removal company, Innovative, was contracted and mobilized to the Site on September 12, 2019. Innovative cut open the tank to reveal that the UST was partially filled with gasoline. Innovative pumped out the gasoline, cleaned the bottom of the tank, and generated three 55-gallon drums of gasoline and tank bottoms. The tank was taken offsite by Innovative to be disposed of as scrap metal.

A summary of soil disposal from the UST source areas is included in the table below.

UST Source Area	Tons of Soil Disposed of Offsite	Disposal Facility
UST No. 1	85.34	Former New Jersey Zinc – West Plant in Palmerton, PA
UST No. 2	203.25	Former New Jersey Zinc – West Plant in Palmerton, PA
UST No. 4	52.36	Former New Jersey Zinc – West Plant in Palmerton, PA

2.3.1.2 UST Source Area Endpoint Sampling

As discussed in Section 2.3.4, all UST source areas were delineated via sidewall sample collection during the ESP completed by Roux in January – February 2019. All sidewall samples collected met both UUSCOs and RRSCOs with the exception of one exceedance of UUSCOs for acetone. Following completion of UST source area excavation during redevelopment, bottom endpoint groundwater and soil grab samples were collected at 9 ft bls from each of the three hot spot areas following completion of excavation. Once the tank discovered on September 11, 2019 (associated with sample ID: UST-5) was removed, endpoint soil grab samples were collected from below the location of the UST at 4-5 ft bls.

Groundwater and soil samples were analyzed for VOCs and PAHs. All bottom endpoint samples that were collected following UST source area excavation are outlined below:

Date Collected	Sample ID	Associated UST	Sample Type
8/15/2019	UST-1-GW	UST-1	Groundwater
9/5/2019	UST-2-GW	UST-2	Groundwater
9/6/2019	UST-4-GW	UST-4	Groundwater
9/16/2019	UST-1_8-9	UST-1	Soil
9/16/2019	UST-2_9-10	UST-2	Soil
9/16/2019	UST-4_9-10	UST-4	Soil
9/16/2019	UST-5_4-5-1	UST-5	Soil
9/16/2019	UST-5_4-5-2	UST-5	Soil

There were no exceedances of UUSCOs or RRSCOs in any soil bottom endpoint sample. On September 18, 2019 Roux received NYSDEC approval, via e-mail, to backfill and pour concrete for building foundations in areas of the former UST source areas. Soil analytical results of UST source area endpoint sampling are summarized in Tables 3and4.

2.3.1.3 Excavation for Site Redevelopment

As part of the Site's redevelopment, excavation to approximately 8 ft bls was completed for the majority of the Site to facilitate the installation of the foundation of the building under construction at the time this SMP was issued. In areas outside of the building's foundation footprint, excavation to approximately 2 ft bls was completed to allow for installation of the Site Cover System.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated October 2016 are as follows:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.

- Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.

- Prevent the discharge of contaminants to surface water.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

RAOs for Environmental Protection

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

Soil Vapor

RAOs for Public Health Protection

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

2.5 Remaining Contamination

The Remedial Action (RA) was designed to reduce onsite contamination through excavation and offsite disposal of contaminant source areas including:

- Removal of any underground storage tanks (USTs), underground piping or other structures associated with a source of contamination; and

- NAPL (non-aqueous phase liquid), if encountered.

The selected Track 4 cleanup permits the remedial program to include the use of long-term IC and ECs to address remaining contaminated media left in place following the implementation of the RA.

2.5.1 Soil

As specified in the NYSDEC-approved RAWP, a Track 4 remedy was selected for the Site which consisted of the removal of existing USTs, excavation of petroleum impacted soil to a depth of approximately 9 feet within the UST source areas (as identified in the NYSDEC-approved RAWP), excavation to a depth of approximately 8 ft bls and disposal of historic fill soil during construction of the building foundations, and the installation of a Site Cover System consisting of building foundations, concrete walkways/driveways, or 2 feet of soil meeting Restricted Residential Soil Cleanup Objectives (RRSCOs). All remaining exceedances of RRSCOs were addressed by installing a Site Cover System. Details regarding the Site Cover System are discussed below in Section 3.3.1.

As specified in the NYSDEC-approved RAWP, endpoint sample collection was focused around the UST source area excavations and Site-wide documentation endpoint samples were not collected. In order to provide relevant soil quality data representative of soils/urban fill below the building's foundation/Site Cover System, Figure 4 includes exceedances of UUSCOs, RRSCOs, and PGWSCOs identified in the Phase II ESA, RI, ESP, or RAWP implementation starting at 5 ft below initial Site grade. While the Site was excavated to 8 ft bls for the building's cellar and to 2 ft for the remainder of the Site, urban fill remained below the bottom of the excavation, and therefore the data provided on Figure 4 is representative of soil quality and contaminant concentrations that may be encountered if the Site Cover System were to be breached.

2.5.2 Groundwater

As discussed above, groundwater grab samples were collected from each UST source area (No. 1, 2, and 4) following excavation. Each grab sample was analyzed for VOCs and PAHs without filtration. Tables 5 and 6 and Figure 5 summarize the results of all

groundwater samples that exceed AWQSGVs after completion of the RA. The exceedances of AWQSGVs are related to the suspended sediment in the grab sample and not of the groundwater quality in the area. All soil sidewall and bottom endpoint samples from the UST source areas yielded analytical results below UUSCOs, with the exception of one sample for acetone, which is a typical lab contaminant. Based on the clean endpoint results surrounding the UST source area excavations, the source of contamination to groundwater has been successfully removed and groundwater monitoring is not required.

2.5.3 Soil Vapor

Soil vapor data was collected during the Phase II ESA and RI, as discussed in Section 2.3. Soil vapor analytical data tables and figures from the Phase II ESA and RI are included in Appendix D. Soil vapor concentrations from the Phase II ESA and RI were generally low and have been addressed through the excavation and offsite disposal of soil from the UST source areas and excavation down to approximately 8 ft bls for the majority of the Site to facilitate the installation of the building's foundation. As part of the Site's redevelopment, a 46-mil Preprufe 300R membrane coupled with Bituthene 4000 was installed as the building's waterproof barrier. While a vapor barrier was not included as a remedial element in the NYSDEC-approved RAWP or DD, this waterproofing will also act as a vapor barrier and will mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into the buildings.

Based on the data collected, a soil vapor intrusion evaluation was completed. Onsite soil vapor concentrations were generally low and do not represent a vapor intrusion concern for the new building. Additionally, underground parking, resident bike storage, and back-of-house utility storage make up the vast majority of the building's overall footprint. The underground parking will be ventilated in accordance with the requirements of the New York City Department of Buildings. As such, this soil vapor intrusion evaluation demonstrates that the RA has addressed potential exposures related to soil vapor intrusion.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the Site, 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 Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

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

3.2 Institutional Controls

A series of ICs is required by the Decision Document 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 Site to restricted residential, commercial, and/or industrial uses only. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The IC boundary is shown on the Environmental Easement and associated Site Survey, included as Appendix A. These ICs are:

- The property may be used for restricted residential, commercial, and/or industrial use;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP.
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the NYCDOHM to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement;
- The potential for vapor intrusion must be evaluated for any future buildings (excluding the building currently under construction at the time this SMP was issued) developed in the area within the IC boundaries noted on the Survey (Appendix A), and any potential impacts that are identified must be monitored or mitigated (this evaluation was completed above for the buildings currently under construction at the time this SMP was issued); and
- Vegetable gardens and farming on the Site are prohibited.

3.3 Engineering Controls

3.3.1 Site Cover System

Exposure to remaining contamination at the Site is prevented by a Site Cover System placed over the Site. The Site Cover System will consist of a demarcation layer and 24-inches of gravel, 24-inches of clean soil, pavers, asphalt, and/or building slabs. Figure 6 shows the location of the Site Cover System types and applicable demarcation layers. In the event that the Site Cover System is modified the requirements of this SMP and the EWP will be complied with. The EWP provided in Appendix E outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in the Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the Site and provided in Appendix F.

3.3.2 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 decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

3.3.2.1 –Site Cover System

The site cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC.

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

- 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:

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

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General Site conditions at the time of the inspection;

- The Site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that Site records are up to date.

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

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

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.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

The Site remedy does not rely on any mechanical systems, such as groundwater treatment systems, sub-slab depressurization systems, or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

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

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

6.1.1 Flood Plain

The southwestern perimeter of the Site is bounded by the Harlem River. The Site is currently within the AE flood zone and is subject to inundation by the 1% annual chance of flood event. As part of the Site's remediation and redevelopment, a new sheet pile support of excavation (SOE) has been installed along the shoreline. The top of the sheet pile caps is at elevations ranging from 5.96 to 8.22 ft NAVD 88. Redevelopment of the Site also incorporates waterproofing using a 46-mil Preprufe 300R membrane coupled with Bituthene 4000, to at least El. +13.0 ft on the building's foundation walls.

6.1.2 Erosion

The Site will be primarily covered by buildings and pavement. Landscaping, pavers, and concrete sidewalks are proposed along the redevelopment's shoreline and will prevent erosion.

6.1.3 Electricity

There are no remedial aspects of the Site that would be affected in the event of an electricity outage.

6.1.4 Site Drainage and Storm Water Management

A building encompasses the majority of the Site. Drainage from the roof of the building will be managed by roof drains that direct stormwater to the New York City sewer system. Onsite stormwater in the area surrounding the building will be managed via trench drains, planter drains, and catch basins. Storm water will pass through a downstream defender that will capture and retain sediment, oils, and floatables prior to discharge into the New York City sewer system. The offsite surrounding area drains to the New York City sewer system through catch basins near the Site.

6.1.5 High Wind

There are no remedial aspects of the Site that would be affected by high wind.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology.

During construction, the Volunteer sought and received approval for use of 500 cubic yards of recycled concrete aggregate from a registered New York State Construction and Demolition processing facility, which would otherwise have required use of virgin resources. In addition, the Volunteer exported approximately 800 cubic yards of clean concrete, brick, and asphalt to a permitted Class B recycling facility in New Jersey or NYSDEC Part 360 registered C&D processing facility for recycling. Any future redevelopment activities will also use recycled materials to the extent practicable.

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

All Site management inspection and maintenance events will be recorded on the appropriate site management forms provided in Appendix G. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records 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 and summarized in the Periodic Review Report.

Table 7: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Periodic Review Report	Annually until completion and documentation of all development-related construction, then every 3 years thereafter.

* 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);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Any observations, conclusions, or recommendations; and

- A determination as to whether contaminant conditions have changed since the last reporting event.
- Routine maintenance event reporting forms will include, at a minimum:
- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

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

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

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

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site.
- Results of the required annual Site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- If any is collected, data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- If any is generated, results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.
- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the Site-specific RAWP;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;

- Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and
- The overall performance and effectiveness of the remedy.

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 Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

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

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *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, Noelle M. Clarke, P.E., of Roux Environmental Engineering and Geology, D.P.C., am certifying as Owner's/Remedial Party's Designated Site Representative for the site."

- *No new information has come to my attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid; and*
- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

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

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.

8.0 REFERENCES

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

Environmental Business Consultants, February 2016. Remedial Investigation Report.

Environmental Business Consultants, August 2016. Remedial Action Work Plan.

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C., October 28, 2014. Phase I Environmental Site Assessment (ESA)/Phase II ESA.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

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

Roux Environmental Engineering and Geology, D.P.C., November 16, 2018. Endpoint Sampling Plan.

TABLES

1. Notifications (Embedded in Text)
2. Groundwater Elevation Measurements
3. Summary of Remaining Volatile Organic Compound Exceedances in Soil
4. Summary of Remaining Semivolatile Organic Compound Exceedances in Soil
5. Summary of Remaining Volatile Organic Compound Exceedances in Groundwater
6. Summary of Remaining Semivolatile Organic Compound Exceedances in Groundwater
7. Interim Reporting Summary/Schedule (Embedded in Text)

Table 2. Groundwater Elevation Measurements - 2401 Third Avenue, Bronx, New York

Well ID	Date	Well Elevation (ft bls)	DTW (ft bls)	DTB (ft bls)	Corrected Groundwater Elevation (ft NAVD88)
RXMW-1	1/25/2019	5.80	9.7	13.76	-3.90
RXMW-2	1/25/2019	5.12	7.43	14.06	-2.31
RXMW-3	1/25/2019	7.56	5.67	14.41	1.89
RXMW-1	2/4/2019	5.80	9.73	13.75	-3.93
RXMW-2	2/4/2019	5.12	7.38	14.02	-2.26
RXMW-3	2/4/2019	7.56	5.65	14.43	1.91

Notes:
DTW - Depth to Water
DTB - Depth to Bottom
ft bls - feet below land surface
NAVD88 - North American Vertical Datum of 1988

Notes Utilized Throughout Tables	
Soil Tables	
J -	Estimated value
U -	Indicates that the compound was analyzed for but not detected
B -	The analyte was found in an associated blank as well as in the sample
P -	The RPD between the results for the two columns exceeds the method-specified criteria
RPD -	Relative Percent Difference
T -	Indicates that a quality control parameter has exceeded laboratory limits
ft bls -	Feet below land surface
FD -	Duplicate sample
NA -	Compound was not analyzed for by laboratory
mg/kg -	Milligrams per kilogram
NYSDEC -	New York State Department of Environmental Conservation
SCO -	Soil Cleanup Objectives
--	No SCO available
Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use SCO	
Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential SCO	
Red data indicates that parameter was detected above the NYSDEC Part 375 Protection of Groundwater SCO	
Groundwater Tables	
J -	Estimated Value
U -	Compound was analyzed for but not detected
FD -	Duplicate
NA -	Compound was not analyzed for by laboratory
µg/L -	Micrograms per liter
ng/L -	Nanogram per liter
NYSDEC -	New York State Department of Environmental Conservation
AWQSGVs -	Ambient Water-Quality Standards and Guidance Values
--	No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs	
For Per- and Polyfluoroalkyl Substances, bold data indicates that parameter was detected	

Table 3. Summary of Remaining Volatile Organic Compound Exceedances in Soil - 2401 Third Avenue, Bronx, New York

			Sample Designation:	RXSB-5
			Sample Date:	01/10/2019
			Sample Depth (ft bls):	7 - 9
			Normal Sample or Field Duplicate:	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	Units	
1,1,1-Trichloroethane (TCA)	0.68	100	MG/KG	0.0016 UJ
1,1,2,2-Tetrachloroethane	--	--	MG/KG	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	MG/KG	NA
1,1,2-Trichloroethane	--	--	MG/KG	NA
1,1-Dichloroethane	0.27	26	MG/KG	0.0016 U
1,1-Dichloroethene	0.33	100	MG/KG	0.0016 U
1,2,3-Trichlorobenzene	--	--	MG/KG	NA
1,2,4-Trichlorobenzene	--	--	MG/KG	NA
1,2,4-Trimethylbenzene	3.6	52	MG/KG	0.00064 J
1,2-Dibromo-3-Chloropropane	--	--	MG/KG	NA
1,2-Dibromoethane (Ethylene Dibromide)	--	--	MG/KG	NA
1,2-Dichlorobenzene	1.1	100	MG/KG	0.0016 U
1,2-Dichloroethane	0.02	3.1	MG/KG	0.0016 U
1,2-Dichloropropane	--	--	MG/KG	NA
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	MG/KG	0.0016 U
1,3-Dichlorobenzene	2.4	49	MG/KG	0.0016 U
1,4-Dichlorobenzene	1.8	13	MG/KG	0.0016 U
1,4-Dioxane (P-Dioxane)	0.1	13	MG/KG	0.033 U
2-Hexanone	--	--	MG/KG	NA
Acetone	**0.05**	100	MG/KG	**0.15**
Benzene	0.06	4.8	MG/KG	0.00092 J
Bromochloromethane	--	--	MG/KG	NA
Bromodichloromethane	--	--	MG/KG	NA
Bromoform	--	--	MG/KG	NA
Bromomethane	--	--	MG/KG	NA
Carbon Disulfide	--	--	MG/KG	NA
Carbon Tetrachloride	0.76	2.4	MG/KG	0.0016 U
Chlorobenzene	1.1	100	MG/KG	0.0016 U
Chloroethane	--	--	MG/KG	NA
Chloroform	0.37	49	MG/KG	0.0016 U
Chloromethane	--	--	MG/KG	NA
Cis-1,2-Dichloroethylene	0.25	100	MG/KG	0.0016 U

Table 3. Summary of Remaining Volatile Organic Compound Exceedances in Soil - 2401 Third Avenue, Bronx, New York

			Sample Designation:	RXSB-5
			Sample Date:	01/10/2019
			Sample Depth (ft bls):	7 - 9
			Normal Sample or Field Duplicate:	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	Units	
Cis-1,3-Dichloropropene	--	--	MG/KG	NA
Cyclohexane	--	--	MG/KG	NA
Dibromochloromethane	--	--	MG/KG	NA
Dichlorodifluoromethane	--	--	MG/KG	NA
Ethylbenzene	1	41	MG/KG	0.00048 J
Isopropylbenzene (Cumene)	--	--	MG/KG	NA
m,p-Xylene	--	--	MG/KG	NA
Methyl Acetate	--	--	MG/KG	NA
Methyl Ethyl Ketone (2-Butanone)	0.12	100	MG/KG	0.023
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	MG/KG	NA
Methylcyclohexane	--	--	MG/KG	NA
Methylene Chloride	0.05	100	MG/KG	0.0022 B
N-Butylbenzene	12	100	MG/KG	0.00039 J
N-Propylbenzene	3.9	100	MG/KG	0.00054 J
O-Xylene (1,2-Dimethylbenzene)	--	--	MG/KG	NA
Sec-Butylbenzene	11	100	MG/KG	0.00067 J
Styrene	--	--	MG/KG	NA
T-Butylbenzene	5.9	100	MG/KG	0.0016 U
Tert-Butyl Methyl Ether	0.93	100	MG/KG	0.001 J
Tetrachloroethylene (PCE)	1.3	19	MG/KG	0.0016 U
Toluene	0.7	100	MG/KG	0.0016 U
Trans-1,2-Dichloroethene	0.19	100	MG/KG	0.0016 U
Trans-1,3-Dichloropropene	--	--	MG/KG	NA
Trichloroethylene (TCE)	0.47	21	MG/KG	0.0016 U
Trichlorofluoromethane	--	--	MG/KG	NA
Vinyl Chloride	0.02	0.9	MG/KG	0.0016 U
Xylenes	0.26	100	MG/KG	NA
Xylenes, Total	0.26	100	MG/KG	0.00068 J

Table 4. Summary of Remaining Semivolatile Organic Compound Exceedances in Soil - 2401 Third Avenue, Bronx, New York

			Sample Designation:	RXMW-2
			Sample Date:	01/15/2019
			Sample Depth (ft bls):	7 - 9
			Normal Sample or Field Duplicate:	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	Units	
Acenaphthene	20	100	MG/KG	0.73 U
Acenaphthylene	100	100	MG/KG	0.73 U
Anthracene	100	100	MG/KG	0.2 J
Benzo(A)Anthracene	1	1	MG/KG	0.94
Benzo(A)Pyrene	**1**	1	MG/KG	**1.3**
Benzo(B)Fluoranthene	**1**	1	MG/KG	**1.7**
Benzo(G,H,I)Perylene	100	100	MG/KG	0.78
Benzo(K)Fluoranthene	0.8	3.9	MG/KG	0.64
Chrysene	1	3.9	MG/KG	0.71 J
Dibenz(A,H)Anthracene	0.33	0.33	MG/KG	0.27
Fluoranthene	100	100	MG/KG	1.1
Fluorene	30	100	MG/KG	0.064 J
Indeno(1,2,3-C,D)Pyrene	**0.5**	0.5	MG/KG	**0.97**
Naphthalene	12	100	MG/KG	0.34 J
Phenanthrene	100	100	MG/KG	0.64 J
Pyrene	100	100	MG/KG	2.1

Table 5. Summary of Remaining Volatile Organic Compound Exceedances in Groundwater - 2401 Third Avenue, Bronx, New York

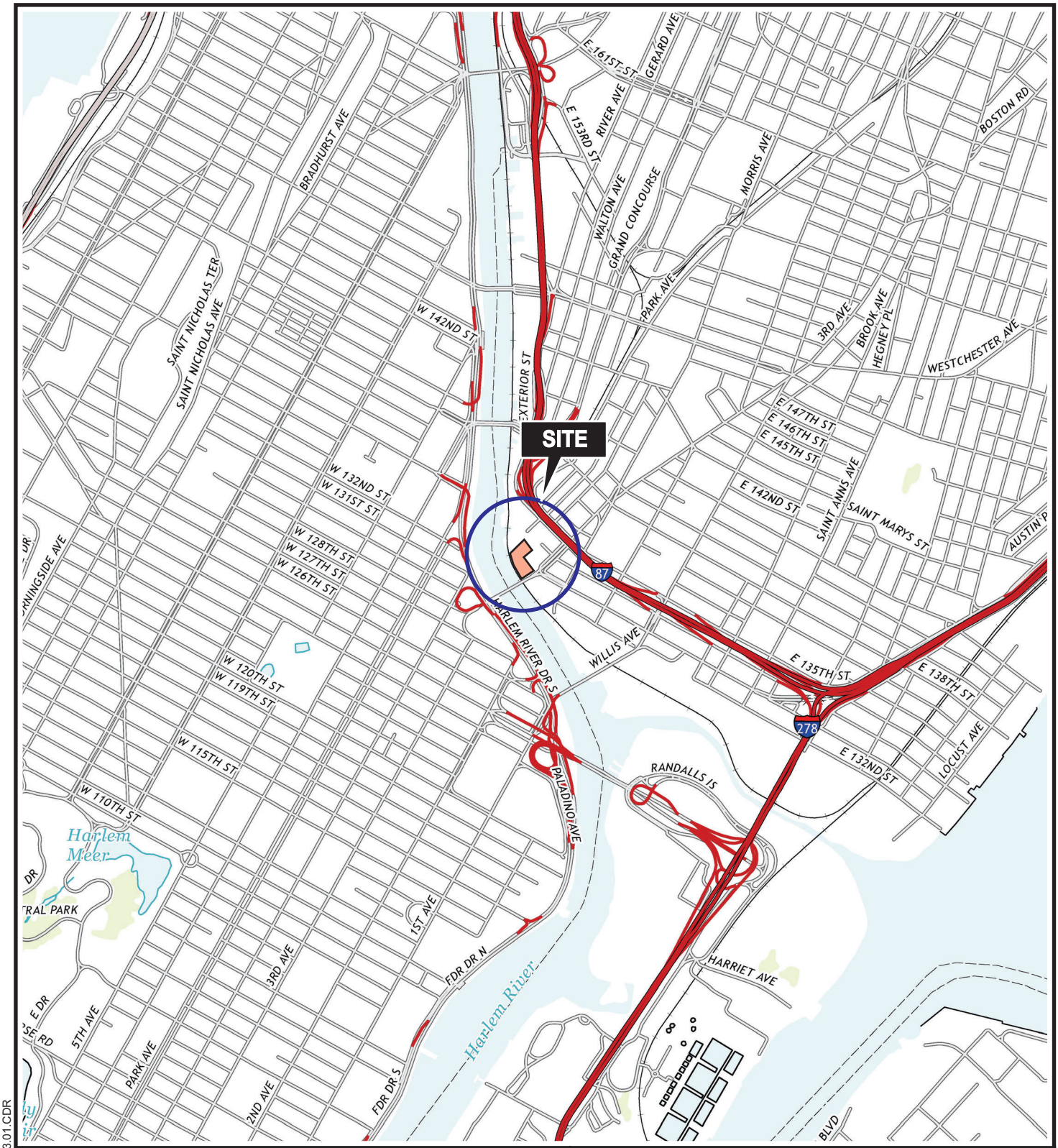
	Sample Designation:		UST-2-GW	UST-4-GW
	Sample Date:		09/05/2019	09/06/2019
	Normal Sample or Field Duplicate:		N	N
Parameter	NYSDE Ambient Water Quality Standards and Guidance Values	Units		
1,1,1-Trichloroethane (TCA)	5	UG/L	1 U	1 UJ
1,1-Dichloroethane	5	UG/L	1 U	1 U
1,1-Dichloroethene	5	UG/L	1 U	1 U
1,2,4-Trimethylbenzene	**5**	UG/L	**120**	**240**
1,2-Dichlorobenzene	3	UG/L	1 U	1 U
1,2-Dichloroethane	0.6	UG/L	1 U	1 U
1,3,5-Trimethylbenzene (Mesitylene)	**5**	UG/L	**37**	**52**
1,3-Dichlorobenzene	3	UG/L	1 U	1 U
1,4-Dichlorobenzene	3	UG/L	1 U	1 U
1,4-Dioxane (P-Dioxane)	--	UG/L	50 U	50 U
Acetone	50	UG/L	21	5 U
Benzene	**1**	UG/L	**230**	1 U
Carbon Tetrachloride	5	UG/L	1 U	1 U
Chlorobenzene	5	UG/L	1 U	1 U
Chloroform	7	UG/L	1 U	1 U
Cis-1,2-Dichloroethylene	5	UG/L	1 U	1 U
Ethylbenzene	**5**	UG/L	**150**	**8.1**
Methyl Ethyl Ketone (2-Butanone)	50	UG/L	5.6	5 U
Methylene Chloride	5	UG/L	1 U	1 U
N-Butylbenzene	5	UG/L	4.6	1 U
N-Propylbenzene	**5**	UG/L	**31**	**20**
Sec-Butylbenzene	5	UG/L	3.5	2.2
T-Butylbenzene	5	UG/L	0.51 J	1 U
Tert-Butyl Methyl Ether	**10**	UG/L	**110**	1 U
Tetrachloroethylene (PCE)	5	UG/L	1 U	1 U
Toluene	**5**	UG/L	**25**	1 U
Trans-1,2-Dichloroethene	5	UG/L	1 U	1 U
Trichloroethylene (TCE)	5	UG/L	1 U	1 U
Vinyl Chloride	2	UG/L	1 U	1 U
Xylenes	**5**	UG/L	**300**	**98**

Table 6. Summary of Remaining Semivolatile Organic Compound Exceedances in Groundwater - 2401 Third Avenue, Bronx, New York

	Sample Designation:		**UST-4-GW**
	Sample Date:		**09/06/2019**
	Normal Sample or Field Duplicate:		**N**
Parameter	NYSDE Ambient Water Quality Standards and Guidance Values	Units	
1,4-Dioxane (P-Dioxane)	--	UG/L	NA
Acenaphthene	20	UG/L	10 U
Acenaphthylene	20	UG/L	10 U
Anthracene	50	UG/L	10 U
Benzo(A)Anthracene	0.002	UG/L	1 U
Benzo(A)Pyrene	0	UG/L	1 U
Benzo(B)Fluoranthene	0.002	UG/L	2 U
Benzo(G,H,I)Perylene	--	UG/L	10 U
Benzo(K)Fluoranthene	0.002	UG/L	1 U
Chrysene	0.002	UG/L	2 U
Dibenz(A,H)Anthracene	--	UG/L	1 U
Fluoranthene	50	UG/L	10 U
Fluorene	50	UG/L	10 U
Indeno(1,2,3-C,D)Pyrene	0.002	UG/L	2 U
Naphthalene	**10**	UG/L	**64**
Phenanthrene	50	UG/L	10 U
Pyrene	50	UG/L	10 U

FIGURES

1. Site Location Map
2. Site Layout Map
   (Sample Locations, Boundaries, Tax Parcels, etc.)
3. Geologic Cross Section
4. Groundwater Contour Maps
5. Remaining Soil Sample Exceedances
6. Remaining Groundwater Sample Exceedances
7. Location of Composite Cover System



QUADRANGLE LOCATION

SOURCE:
USGS; 2013, Central Park, NY
7.5 Minute Topographic Quadrangle

N

0 2000'

Title:

SITE LOCATION MAP

Prepared for:

BOP 2401 THIRD AVENUE, LLC

ROUX

Compiled by: L.D.	Date: 22JUL20	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	1
Project Mgr: L.D.	Project: 3171.0001Y000	
File: 3171.0001Y133.01.CDR		

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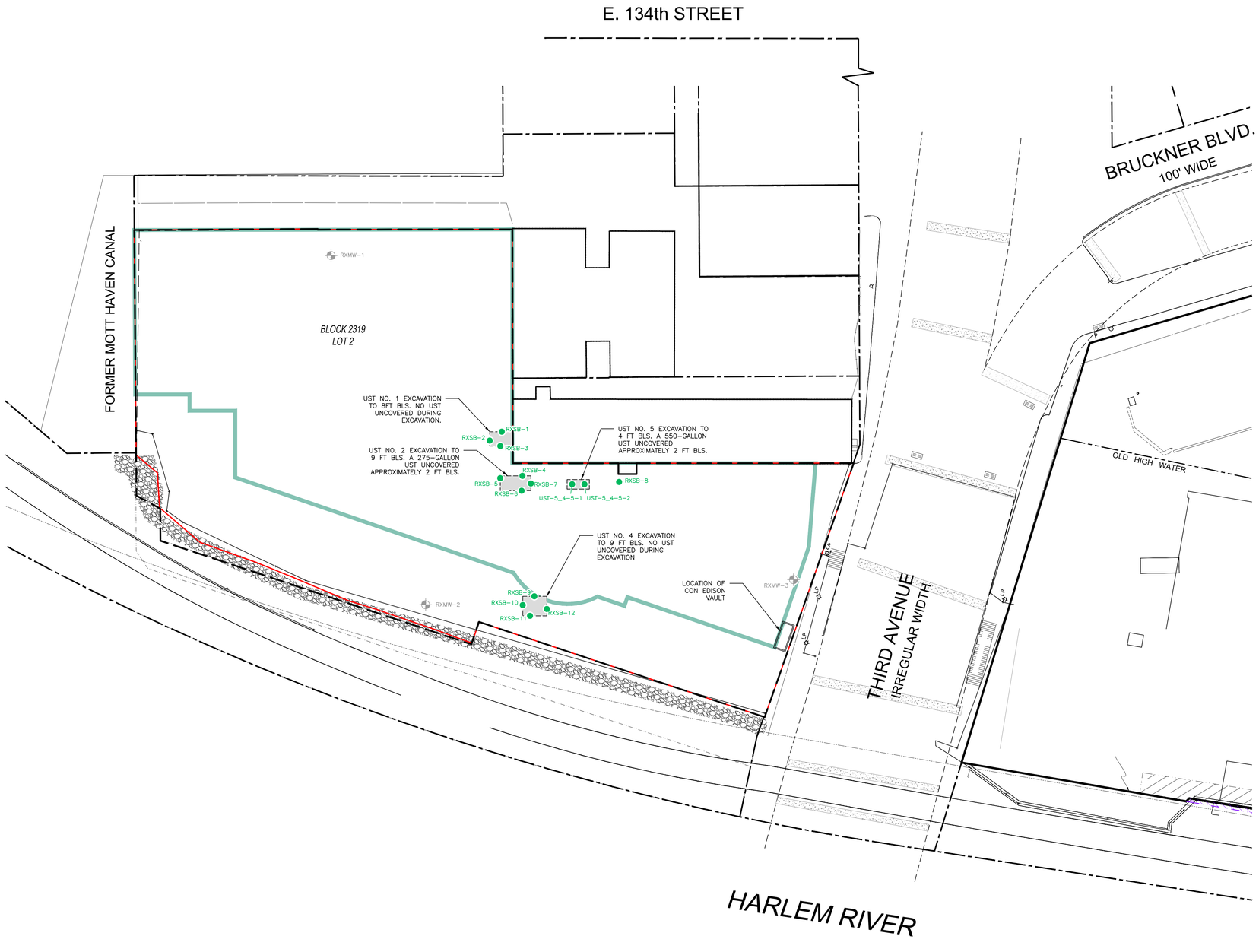

LEGEND

- RXSB-2 — LOCATION AND DESIGNATION OF ENDPOINT SAMPLE
- RXMW-3 — LOCATION AND DESIGNATION OF FORMER MONITORING WELL
- LOCATION AND DESIGNATION OF UNDERGROUND STORAGE TANK (UST) SOURCE AREA EXCAVATION
- BROWNFIELD CLEANUP PROGRAM (BCP) LINE
- PROPERTY LINE
- APPROXIMATE EXTENTS OF BUILDING'S FOUNDATION
- CON EDISON VAULT LOCATION FOR ELECTRIC SERVICE

NOTE

1. BASEMAP PREPARED FROM SURVEY PERFORMED BY HIRANI ENGINEERING & LAND SURVEYING, P.C., AUGUST 2018.
2. FT BLS – FEET BELOW LAND SURFACE

30' 0 30'

Title:

SITE LAYOUT PLAN

Prepared for:

BOP 2401 THIRD AVE, LLC

ROUX

Compiled by: L.D.	Date: 22JUL20	FIGURE 2
Prepared by: G.M.	Scale: AS SHOWN	
Project Mgr: L.D.	Project: 3171.0001Y000	
File: 3171.0001Y133.02.DWG		

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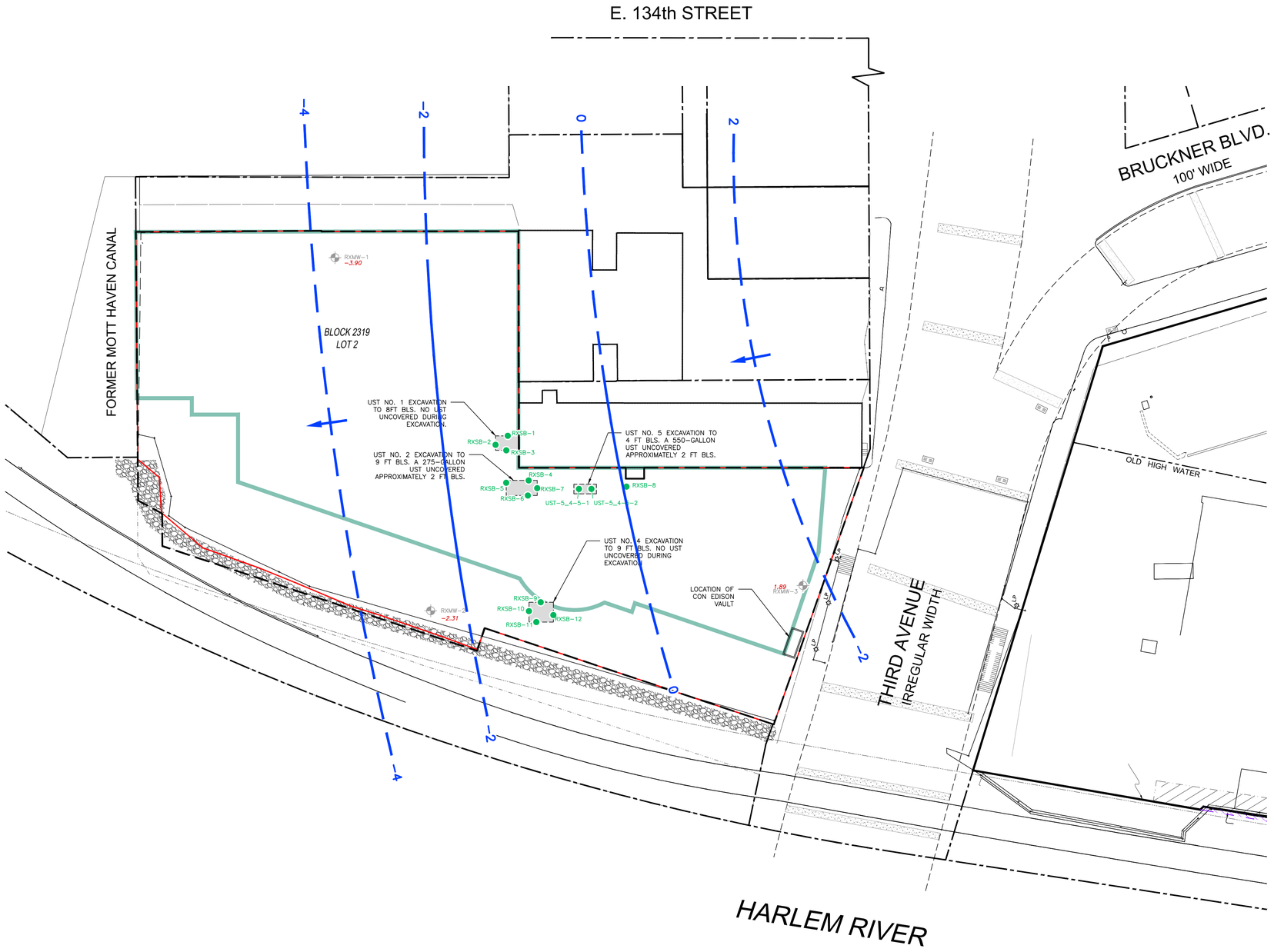

LEGEND

- RXSB-2 — LOCATION AND DESIGNATION OF ENDPOINT SAMPLE
- RXMW-3 — LOCATION AND DESIGNATION OF FORMER MONITORING WELL
- LOCATION AND DESIGNATION OF UNDERGROUND STORAGE TANK (UST) SOURCE AREA EXCAVATION
- BROWNFIELD CLEANUP PROGRAM (BCP) LINE
- PROPERTY LINE
- APPROXIMATE EXTENTS OF BUILDING'S FOUNDATION
- CON EDISON VAULT LOCATION FOR ELECTRIC SERVICE
- -3.92 — GROUNDWATER ELEVATION (RELATIVE TO NAVD 88)
- 0 — LINE OF EQUAL GROUNDWATER ELEVATION (RELATIVE TO NAVD 88) (DASHED WHERE INFERRED)
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW

NOTE

1. BASEMAP PREPARED FROM SURVEY PERFORMED BY HIRANI ENGINEERING & LAND SURVEYING, P.C., AUGUST 2018.
2. FT BLS – FEET BELOW LAND SURFACE
3. NAVD 88 – NORTH AMERICAN VERTICAL DATUM OF 1988

30' 0 30'

Title:

GROUNDWATER CONTOUR MAP JANUARY 25, 2019

Prepared for:

BOP 2401 THIRD AVE, LLC

ROUX

Compiled by: L.D.	Date: 22JUL20	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	3
Project Mgr: L.D.	Project: 3171.0001Y000	
File: 3171.0001Y133.02.DWG		

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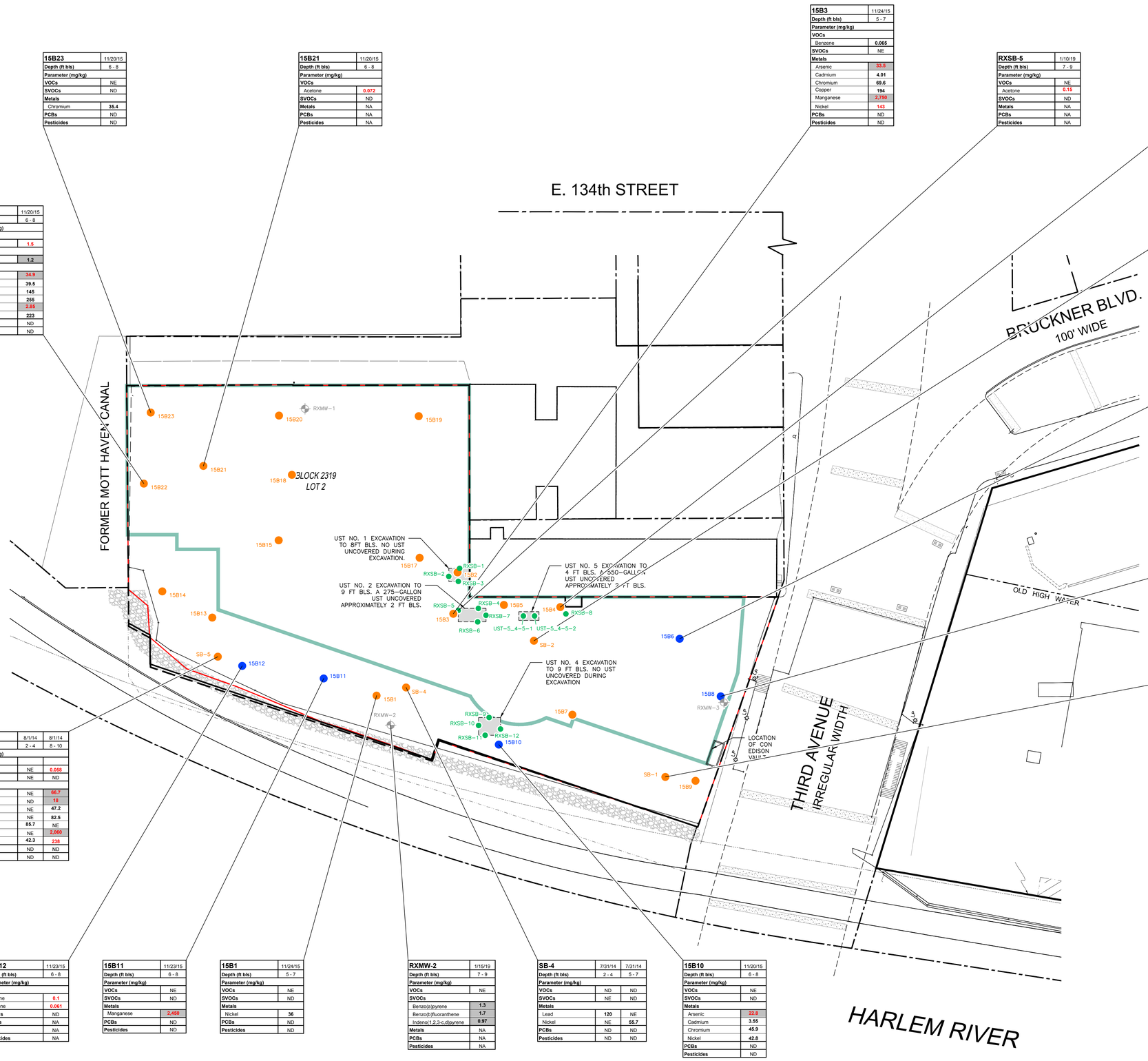

15B23	11/20/15
Depth (ft bls)	6 - 8
Parameter (mg/kg)	
VOCs	NE
SVOCs	ND
Metals	
Chromium	35.4
PCBs	ND
Pesticides	ND

15B21	11/20/15
Depth (ft bls)	6 - 8
Parameter (mg/kg)	
VOCs	
Acetone	0.072
SVOCs	ND
Metals	NA
PCBs	NA
Pesticides	NA

15B22	11/20/15
Depth (ft bls)	6 - 8
Parameter (mg/kg)	
VOCs	
Acetone	1.5
SVOCs	
Benzo(a)pyrene	1.2
Metals	
Arsenic	34.9
Chromium	39.5
Copper	145
Lead	255
Mercury	2.85
Zinc	223
PCBs	ND
Pesticides	ND

15B3	11/24/15
Depth (ft bls)	5 - 7
Parameter (mg/kg)	
VOCs	
Benzene	0.065
SVOCs	NE
Metals	
Arsenic	33.5
Cadmium	4.01
Chromium	69.6
Copper	194
Manganese	2,750
Nickel	143
PCBs	ND
Pesticides	ND

RXSB-5	1/10/19
Depth (ft bls)	7 - 9
Parameter (mg/kg)	
VOCs	NE
Acetone	0.15
SVOCs	ND
Metals	NA
PCBs	NA
Pesticides	NA

15B4	11/24/15
Depth (ft bls)	6 - 8
Parameter (mg/kg)	
VOCs	
Benzene	0.14
SVOCs	ND
Metals	NE
PCBs	ND
Pesticides	ND

SB-2	7/31/14
Depth (ft bls)	5 - 7
Parameter (mg/kg)	
VOCs	NE
SVOCs	ND
Metals	
Cadmium	3.02
Chromium III	35.1
Manganese	1,640
Nickel	74.6
PCBs	ND
Pesticides	ND

15B6	11/20/15	11/20/15
Depth (ft bls)	3 - 5	10 - 12
Parameter (mg/kg)		
VOCs	NE	NE
SVOCs	ND	ND
Metals		
Cadmium	3.03	NE
Chromium	NE	32.8
Copper	64.6	NE
Manganese	1,660	NE
Nickel	49.6	NE
PCBs	ND	ND
Pesticides	ND	ND

15B8	11/20/15
Depth (ft bls)	6 - 8
Parameter (mg/kg)	
VOCs	
Acetone	0.11
SVOCs	ND
Metals	NA
PCBs	NA
Pesticides	NA

SB-1	7/31/14	7/31/14
Depth (ft bls)	1 - 3	3 - 5
Parameter (mg/kg)		
VOCs	NE	NE
SVOCs	NE	ND
Metals		
Arsenic	16.2	NE
Copper	108	NE
Lead	416	NE
Mercury	1.7	NE
Nickel	38	31.8
Zinc	294	NE
PCBs		
PCBs	0.14	ND
Pesticides		
4,4'-DDD	0.053	ND
4,4'-DDE	0.18	ND
4,4'-DDT	0.26	ND

SB-5	8/1/14	8/1/14
Depth (ft bls)	2 - 4	8 - 10
Parameter (mg/kg)		
VOCs		
Acetone	NE	0.058
SVOCs	NE	ND
Metals		
Arsenic	NE	66.7
Cadmium	ND	18
Chromium III	NE	47.2
Copper	NE	82.5
Lead	85.7	NE
Manganese	NE	2,060
Nickel	42.3	238
PCBs	ND	ND
Pesticides	ND	ND

15B12	11/23/15
Depth (ft bls)	6 - 8
Parameter (mg/kg)	
VOCs	
Acetone	0.1
Benzene	0.061
SVOCs	ND
Metals	NA
PCBs	NA
Pesticides	NA

15B11	11/23/15
Depth (ft bls)	6 - 8
Parameter (mg/kg)	
VOCs	NE
SVOCs	ND
Metals	
Manganese	2,450
PCBs	ND
Pesticides	ND

15B1	11/24/15
Depth (ft bls)	5 - 7
Parameter (mg/kg)	
VOCs	NE
SVOCs	ND
Metals	
Nickel	36
PCBs	ND
Pesticides	ND

RXMW-2	1/15/19
Depth (ft bls)	7 - 9
Parameter (mg/kg)	
VOCs	NE
SVOCs	
Benzo(a)pyrene	1.3
Benzo(b)fluoranthene	1.7
Indeno(1,2,3-c,d)pyrene	0.97
Metals	NA
PCBs	NA
Pesticides	NA

SB-4	7/31/14	7/31/14
Depth (ft bls)	2 - 4	5 - 7
Parameter (mg/kg)		
VOCs	ND	ND
SVOCs	NE	ND
Metals		
Lead	120	NE
Nickel	NE	55.7
PCBs	ND	ND
Pesticides	ND	ND

15B10	11/20/15
Depth (ft bls)	6 - 8
Parameter (mg/kg)	
VOCs	NE
SVOCs	ND
Metals	
Arsenic	22.8
Cadmium	3.55
Chromium	45.9
Nickel	42.8
PCBs	ND
Pesticides	ND

LEGEND

- RXSB-2 — LOCATION AND DESIGNATION OF ENDPOINT SAMPLE COMPLETED DURING THE RAWP
- RXMW-3 — LOCATION AND DESIGNATION OF FORMER MONITORING WELL
- LOCATION AND DESIGNATION OF UNDERGROUND STORAGE TANK (UST) SOURCE AREA EXCAVATION
- SB-1 — LOCATION AND DESIGNATION OF PHASE II SOIL BORING (LANGAN, 2014)
- 15B6 — LOCATION AND DESIGNATION OF REMEDIAL INVESTIGATION SOIL BORING (EBC, 2016)
- BROWNFIELD CLEANUP PROGRAM (BCP) LINE
- PROPERTY LINE
- APPROXIMATE EXTENTS OF BUILDING'S FOUNDATION
- CON EDISON VAULT LOCATION FOR ELECTRIC SERVICE

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Protection of Groundwater SCO	NYSDEC Part 375 Restricted Residential SCO
VOCs			
Acetone	0.05	0.05	100
Benzene	0.06	0.06	4.8
SVOCs			
Benzo(A)Pyrene	1	22	1
Benzo(B)Fluoranthene	1	1.7	1
Indeno(1,2,3-C,D)Pyrene	0.5	8.2	0.5
Metals			
Arsenic	13	16	16
Cadmium	2.5	7.5	4.3
Chromium III	30	NS	180
Chromium, Total	30	NS	180
Copper	50	1720	270
Lead	63	450	400
Manganese	1600	2000	2000
Mercury	0.18	0.73	0.81
Nickel	30	130	310
Zinc	109	2480	10000
PCBs	0.1	3.2	1
Pesticides			
P,P'-DDD	0.0033	14	13
P,P'-DDE	0.0033	17	8.9
P,P'-DDT	0.0033	136	7.9

CONCENTRATIONS IN mg/kg

mg/kg – MILLIGRAMS PER KILOGRAM

NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

VOCS – VOLATILE ORGANIC COMPOUNDS

SVOCs – SEMIVOLATILE ORGANIC COMPOUNDS

PCBs – POLYCHLORINATED BIPHENYLS

ND – NO EXCEEDANCE

NE – NO DETECTION

NA – NOT ANALYZED

NS – NO STANDARD

FT BLS – FEET BELOW LAND SURFACE

NOTE

1. BASEMAP PREPARED FROM SURVEY PERFORMED BY HIRANI ENGINEERING & LAND SURVEYING, P.C., AUGUST 2018.
2. FT BLS – FEET BELOW LAND SURFACE
3. FINAL EXCAVATION DEPTH WITHIN BUILDINGS CELLAR FOOTPRINT IS TO APPROXIMATELY 8 FT BLS. SOIL DATA COLLECTED DURING THE PREVIOUSLY COMPLETED PHASE II AND RI FROM DIRECTLY ABOVE THE FINAL EXCAVATION DEPTH (5–7 FT BLS; 6–8 FT BLS) ARE INCLUDED AND ARE REPRESENTATIVE OF SOIL CONDITIONS EXPECTED TO BE ENCOUNTERED BELOW THE BUILDING SLAB.
4. IF SOIL SAMPLE LOCATION IS SHOWN WITHOUT A SOIL DATA BOX, SAMPLE DID NOT CONTAIN ANY EXCEEDANCES FOR UUSCOs, RRSCOs AND/OR PGWSCOs. SEE TABLE 1 FOR SAMPLE DEPTHS THAT DID NOT CONTAIN AN EXCEEDANCE.

TABLE 1. SOIL SAMPLE DEPTH INTERVALS NOT CONTAINING AN EXCEEDANCE

Boring ID	Sample Interval (ft bls)
15B2	6-8
15B3	13-15
15B4	10-12
15B5	6-8
15B7	6-8
15B9	6-8
15B13	6-8
15B14	5-7
15B15	6-8
15B17	6-8
15B18	6-8
15B19	6-8
15B20	8-10

30' 0 30'

Title:

REMAINING SOIL SAMPLE EXCEEDANCES

Prepared for:

BOP 2401 THIRD AVE, LLC

ROUX

Compiled by: L.D.	Date: 29SEPT20	FIGURE 4
Prepared by: G.M.	Scale: AS SHOWN	
Project Mgr: L.D.	Project: 3171.0001Y000	
File: 3171.0001Y133.03.DWG		

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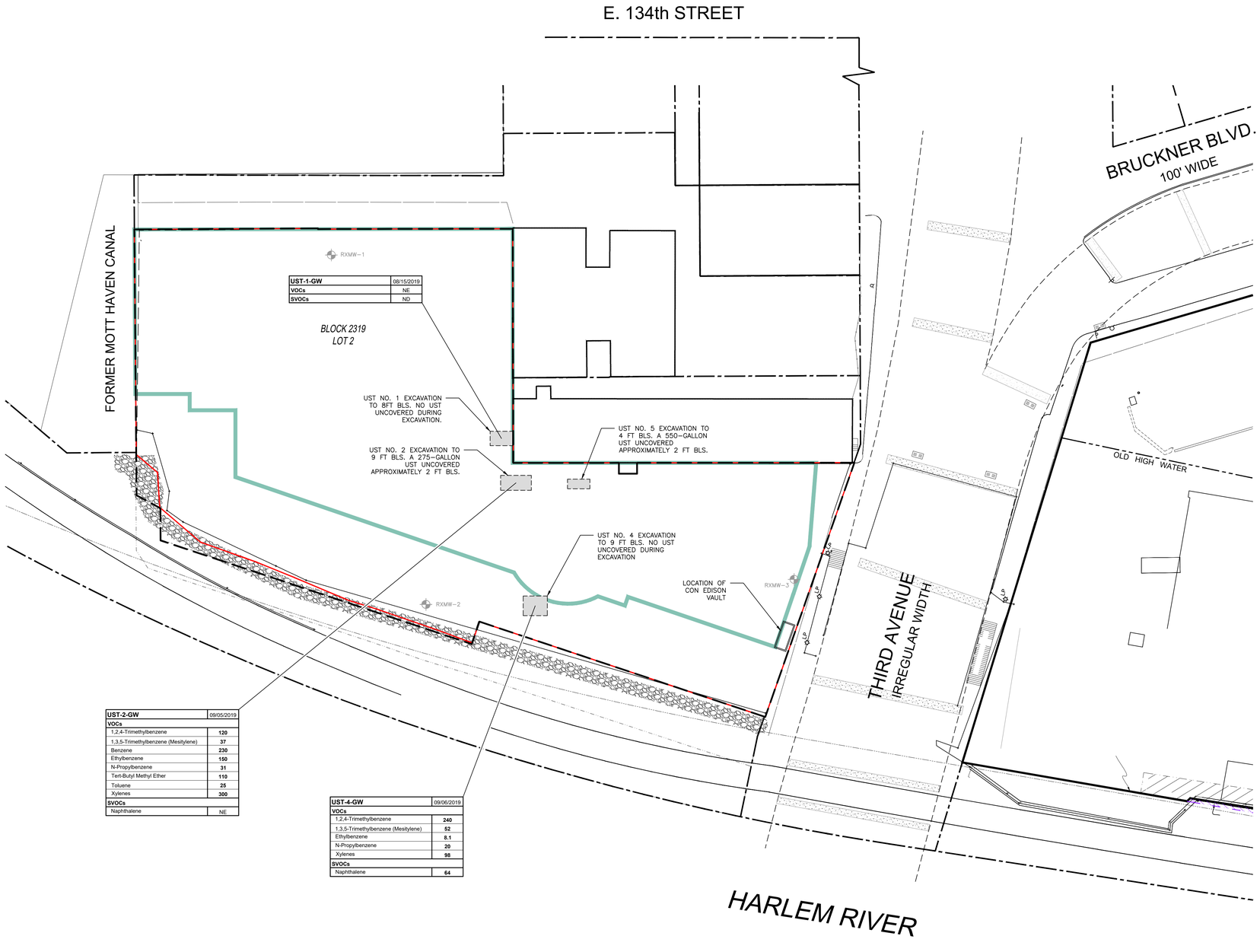

UST-1-GW	08/15/2019
VOCs	NE
SVOCs	ND

UST-2-GW	09/05/2019
VOCs	
1,2,4-Trimethylbenzene	**120**
1,3,5-Trimethylbenzene (Mesitylene)	**37**
Benzene	**230**
Ethylbenzene	**150**
N-Propylbenzene	**31**
Tert-Butyl Methyl Ether	**110**
Toluene	**25**
Xylenes	**300**
SVOCs	
Naphthalene	NE

UST-4-GW	09/06/2019
VOCs	
1,2,4-Trimethylbenzene	**240**
1,3,5-Trimethylbenzene (Mesitylene)	**52**
Ethylbenzene	**8.1**
N-Propylbenzene	**20**
Xylenes	**98**
SVOCs	
Naphthalene	**64**

LEGEND

- RXMW-3 — LOCATION AND DESIGNATION OF FORMER MONITORING WELL
- LOCATION AND DESIGNATION OF UNDERGROUND STORAGE TANK (UST) SOURCE AREA EXCAVATION
- BROWNFIELD CLEANUP PROGRAM (BCP) LINE
- PROPERTY LINE
- APPROXIMATE EXTENTS OF BUILDING'S FOUNDATION
- CON EDISON VAULT LOCATION FOR ELECTRIC SERVICE

Parameter	NYSDEC AWQSGV
VOCs	
1,2,4-Trimethylbenzene	5
1,3,5-Trimethylbenzene (Mesitylene)	5
Benzene	1
Ethylbenzene	5
N-Propylbenzene	5
Tert-Butyl Methyl Ether	10
Toluene	5
Xylenes	5
SVOCs	
Naphthalene	10

CONCENTRATIONS IN µg/L

µg/L – MICROGRAMS PER LITER
NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AWQSGVS – AMBIENT WATER-QUALITY STANDARDS AND GUIDANCE VALUES
– – NOT DETECTED ABOVE NYSDEC AWQSGV
VOCS – VOLATILE ORGANIC COMPOUNDS
SVOCS – SEMIVOLATILE ORGANIC COMPOUNDS
NE – NO EXCEEDANCES
ND – NO DETECTION

NOTE

1. BASEMAP PREPARED FROM SURVEY PERFORMED BY HIRANI ENGINEERING & LAND SURVEYING, P.C., AUGUST 2018.
2. FT BLS – FEET BELOW LAND SURFACE

30' 0 30'

Title:

REMAINING GROUNDWATER EXCEEDANCES

Prepared for:

BOP 2401 THIRD AVE, LLC

ROUX

Compiled by: L.D.	Date: 22JUL20	FIGURE	
Prepared by: G.M.	Scale: AS SHOWN	5	
Project Mgr: L.D.	Project: 3171.0001Y000		
File: 3171.0001Y133.02.DWG			

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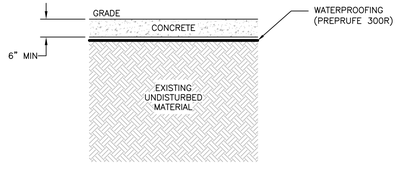
LEGEND

- BROWNFIELD CLEANUP PROGRAM (BCP) LINE
- PROPERTY LINE
- APPROXIMATE EXTENTS OF BUILDING'S FOUNDATION
- CON EDISON VAULT LOCATION FOR ELECTRIC SERVICE
- SITE COVER SYSTEM BUILDING CELLAR FOUNDATION (SEE DETAIL 1)
- SITE COVER SYSTEM BUILDING SLAB ON GRADE FOUNDATION (SEE DETAIL 2)
- SITE COVER SYSTEM CLEAN STONE (SEE DETAIL 3)

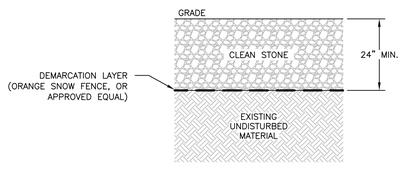
NOTE

1. BASEMAP PREPARED FROM SURVEY PERFORMED BY HIRANI ENGINEERING & LAND SURVEYING, P.C., AUGUST 2018.
2. FT BLS – FEET BELOW LAND SURFACE

1 TYPICAL BUILDING CELLAR FOUNDATION COVER SYSTEM DETAIL
SCALE: 1"=2'



2 TYPICAL BUILDING SLAB ON GRADE FOUNDATION COVER SYSTEM DETAIL
SCALE: 1"=2'



3 TYPICAL TEMPORARY CLEAN STONE COVER SYSTEM DETAIL
SCALE: 1"=2'

30' 0 30'

STATE OF NEW YORK
Noelle M. Clarke
No. 072491
LICENSED PROFESSIONAL ENGINEER

Title:

LOCATION OF ENGINEERING CONTROLS SITE COVER SYSTEM

Prepared for:

BOP 2401 THIRD AVE, LLC

ROUX

Compiled by: L.D.	Date: 03AUG20	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	6
Project Mgr: L.D.	Project: 3171.0001Y000	
File: 3171.0001Y133.02.DWG		

V:\CAD\PROJECTS\3171\0001Y\133\3171.0001Y133.02.DWG

APPENDICES

A. Environmental Easement

B. List of Site Contacts

C. Soil Boring and Monitoring Well Construction Logs

D. Phase II ESA and RI Soil Vapor Data

E. Excavation Work Plan

F. Health and Safety Plan

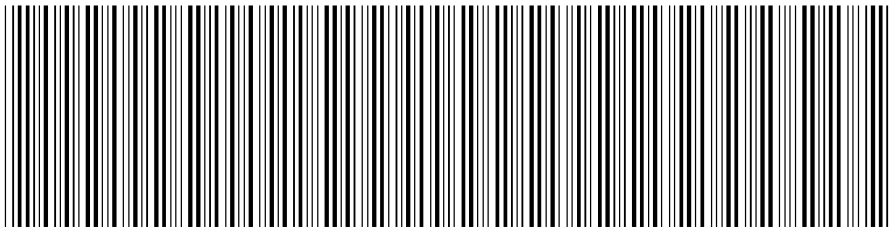
G. Site Management Forms

APPENDIX A

Environmental Easement

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument.The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.



2020092901190001001EFF0F

RECORDING AND ENDORSEMENT COVER PAGE **PAGE 1 OF 11**

Document ID: 2020092901190001 Document Date: 09-15-2020 Preparation Date: 09-29-2020
Document Type: EASEMENT
Document Page Count: 10

PRESENTER:
ROYAL REGISTERED PROPERTY REPORTS
(183229)MB
125 PARK AVENUE, SUITE 1610
NEW YORK, NY 10017
212-376-0900
MBASALATAN@ROYALABSTRACT.COM

RETURN TO:
ROYAL REGISTERED PROPERTY REPORTS
(183229)MB
125 PARK AVENUE, SUITE 1610
NEW YORK, NY 10017
212-376-0900
MBASALATAN@ROYALABSTRACT.COM

PROPERTY DATA

Borough	Block	Lot	Unit	Address
BRONX	2319	2	Entire Lot	2401 3 AVENUE

Property Type: APARTMENT BUILDING Easement

CROSS REFERENCE DATA

CRFN_____ *or* DocumentID_____ *or* _____ Year_____ Reel____ Page_____ *or* File Number_____

PARTIES

GRANTOR/SELLER:
BOP 2401 THIRD AVENUE LLC
C/O BROOKFIELD PROPERTIES, 250 VESSEY STREET,
15TH FLOOR
NEW YORK, NY 10281

GRANTEE/BUYER:
THE PEOPLE OF THE STATE OF NEW YORK
NYSDEC, 625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :

Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	87.00
Affidavit Fee:	$	0.00

Filing Fee: $ 0.00

NYC Real Property Transfer Tax: $ 0.00

NYS Real Estate Transfer Tax: $ 0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 10-15-2020 09:28
City Register File No.(CRFN):
2020000283090

City Register Official Signature

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

THIS INDENTURE made this 15th day of September, 2020, between Owner, BOP 2401 Third Avenue LLC, having an office at c/o Brookfield Properties, 250 Vesey Street, 15th Floor, New York, New York 10281, County of New York, 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 2401 Third Avenue in the City of New York, County of Bronx and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 2319 Lot 2, being a portion of the same property conveyed to Grantor by deed dated September 5, 2018 and recorded in the City Register of the City of New York as CRFN #2018000304336. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 1.378 +/- acres, and is hereinafter more fully described in the Land Title Survey dated April 30, 2020 last revised on August 18, 2020 prepared by Joseph G. Pike, L.L.S. of Hirani Engineering & Land Surveying, P.C., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation

established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C203052-06-15, 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:

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

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

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

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

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

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

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

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

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

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

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), 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: C203052
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.

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

Remainder of Page Intentionally Left Blank

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

BOP 2401 Third Avenue LLC:

By: _____

Print Name: Maria Masi

Title: SVP, Development Date: 9/9/20

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF New York)

On the 9th day of September, in the year 2020, before me, the undersigned, personally appeared Maria Masi, 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

Joseph M. Westervelt
Notary Public, State of New York
No. 01WE6322955
Qualified in Westchester County
My Commission Expires 04/13/2023

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: _____
George W. Heitzman, Assistant Director
Division of Environmental Remediation

Grantee's Acknowledgment

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

On the 15th day of September, in the year 2020, before me, the undersigned, personally appeared George W. Heitzman, 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

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

SCHEDULE "A" PROPERTY DESCRIPTION

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough and County of Bronx, City and State of New York, bounded and described as follows:

Environmental Easement situated in Block 2319 as shown on Bronx Borough Tax Map as part of Lot 2;

BEGINNING at a point on the westerly side of Third Avenue, 380.21' southwesterly from the corner formed by the Intersection of the Westerly side of Third Avenue and the southerly side of East 134th. Street;

RUNNING THENCE Northwesterly N 44°42'41" W a distance of 119.76'to a point;

THENCE S 45°17'19" W a distance of 6.00'to a point;

THENCE N 44°42'41" W a distance of 10.00'to a point;

THENCE N 45°17'19" E a distance of 6.00'to a point;

THENCE N 44°42'41" W a distance of 58.17'to a point;

THENCE N 45°11'14" E a distance of 129.02'to a point;

THENCE N 44°45'56" W a distance of 107.35'to a point;

THENCE N 45°14'04" E a distance of 0.35'to a point;

THENCE N 45°00'06" W a distance of 101.17'to the southerly side of Mott Haven Canal;

THENCE S 44°50'33" W a distance of 124.04'to a point on the northerly side of bulkhead;

THENCE following the westerly side of bulkhead, the following 16 courses;

THENCE S 04°28'38" E a distance of 15.41'to a point;

THENCE S 41°49'33" W a distance of 19.15'to a point;

THENCE S 04°08'34" E a distance of 29.47'to a point;

THENCE S 24°59'40" E a distance of 26.96'to a point;

THENCE S 25°09'42" E a distance of 5.80'to a point;

THENCE S 22°31'05" E a distance of 22.68'to a point;

THENCE S 21°48'40" E a distance of 32.06'to a point;

THENCE S 27°24'38" E a distance of 17.38'to a point;

THENCE S 25°35'36" E a distance of 34.61'to a point;

THENCE S 24°29'26" E a distance of 20.38'to a point;

THENCE N 64°41'20" E a distance of 0.25'to a point;

THENCE N 63°58'50" E a distance of 12.11'to a point;

THENCE S 26°14'19" E a distance of 107.27'to a point;

THENCE S 26°14'19" E a distance of 58.71'to a point;

THENCE N 64°40'00" E a distance of 12.11'to a point;

THENCE S 31°25'43" E a distance of 0.02'to a point at the end of southerly side of bulkhead and the North side of Third Avenue;

THENCE N 64°38'04" E a distance of 136.31'to the point or place of BEGINNING;

Above described parcel having an area of 60039.5 square feet, 1.378 acres.

B. 2319
L. 2
County of Bronx

183229

ENVIRONMENTAL EASEMENT:

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough and County of Bronx, City and State of New York, bounded and described as follows:

Environmental Easement situated in Block 2319 as shown on Bronx Borough Tax Map as part of Lot 2;

BEGINNING at a point on the westerly side of Third Avenue, 380.21' southwesterly from the corner formed by the intersection of the Westerly side of Third Avenue and the southerly side of East 134th. Street;

RUNNING THENCE Northwesterly N 44°42'41" W a distance of 119.76'to a point;

THENCE S 45°17'19" W a distance of 6.00'to a point;

THENCE N 44°42'41" W a distance of 10.00'to a point;

THENCE N 45°17'19" E a distance of 6.00'to a point;

THENCE N 44°42'41" W a distance of 58.17'to a point;

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THENCE S 26°14'19" E a distance of 58.71'to a point;

THENCE N 64°40'00" E a distance of 12.11'to a point;

THENCE S 31°25'43" E a distance of 0.02'to a point at the end of southerly side of bulkhead and the North side of Third Avenue;

THENCE N 64°38'04" E a distance of 136.31'to the point or place of BEGINNING;

Aboved described parcel having an area of 60039.5 square feet, 1.378 acres.

GENERAL NOTES

1. HORIZONTAL DATUM IS ASSUMED.

2. VERTICAL DATUM IS NAVD88 AS ESTABLISHED UTILIZING THE NYSDOT NYSNET GPS RTN NETWORK.

3. THE INFORMATION SHOWN HEREON CORRECTLY REPRESENTS THE CONDITIONS FOUND AT AND AS OF THE DATE OF THE FIELD SURVEY.

4. SUBJECT TO EASEMENTS AND RESTRICTIONS THAT MAY EXIST AS SHOWN IN TITLE REPORT #18-7406-51463-B-002, INCLUDING BUT NOT LIMITED TO: AGREEMENTS; BOUNDARY LINE AND THE LIKE, WRITTEN AND/OR IMPLIED; CLAIMS; CONTRACTS; EASTMENTS; GRANTS; LEASES; LICENSES; LIMITATIONS; MATTER OF FACT; RESERVATIONS; RIGHTS, AERIAL AND/OR SUBTERRANEAN; UNWRITTEN TRANSFERS OR CLAIMS; WELANDS AND/OR ENVIRONMENTAL STUDIES; MUNICIPAL/COUNTY/STATE AND/OR FEDERAL LAWS, ORDINANCES, REGULATIONS, REQUIREMENTS AND RULES, SPECIFICALLY THOSE CONDITIONS PLACED UPON THIS PARCEL THROUGH THE SUBDIVISION PROCESS AND FOUND IN THE BOROUGH OF BRONX APPROVAL RESOLUTION. EASEMENTS NOT SUPPLIED IN TITLE REPORT NOT GUARANTEED.

5. UNLESS OTHERWISE NOTED, LOT AND BLOCK DESIGNATIONS ARE IN ACCORDANCE WITH THE CURRENT TAX MAP OF THE BOROUGH OF BRONX, CITY, COUNTY AND STATE OF NEW YORK, FOR BLOCKS 2316 AND 2319.

6. ALL DIMENSIONS SHOWN ARE IN THE LEGAL OR BLOCK STANDARD OF MEASURMENT AND ARE TO BE USED FOR LEGAL DESCRIPTIONS AND COMPUTATIONS OF THE AREA OF THE LOT. THEY ARE NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

7. SEEK LEGAL ADVICE REGARDING ANY DISCREPANCIES SHOWN ON THIS SURVEY. DISCREPANCIES INCLUDE DIFFERENCES BETWEEN THE WRITTEN RECORD AND THE FIELD EVIDENCE, AS WELL AS, GAPS, OVERLAPS, AND ENCROACHMENTS.

8. THERE ARE NO VISABLE STREAMS NOR NATURAL WATER COURSES IN THE PROPERTY AS SHOWN ON THIS SURVEY. THERE ARE WATER COURSES ADJOINING THE PARCEL.

9. PROPERTY LOCATED IN FEMA FLOOD ZONE AE 11 AS SHOWN ON MAP NUMBER 3604970091F , PANEL 91 OF 457 REVISED SEPTEMBER 5, 2007.

10. PROPERTY ZONING DESIGNATION TO BE DETERMINED.

11. NO MONUMENTS HAVE BEEN SET.

12.NO HYDROGRAPHIC SURVEY PERFORMED FOR THIS SURVEY.

LAND SITUATED IN THE
COUNTY OF BRONX
CITY OF NEW YORK
STATE OF NEW YORK
AS
BLOCK 2319 LOT 2

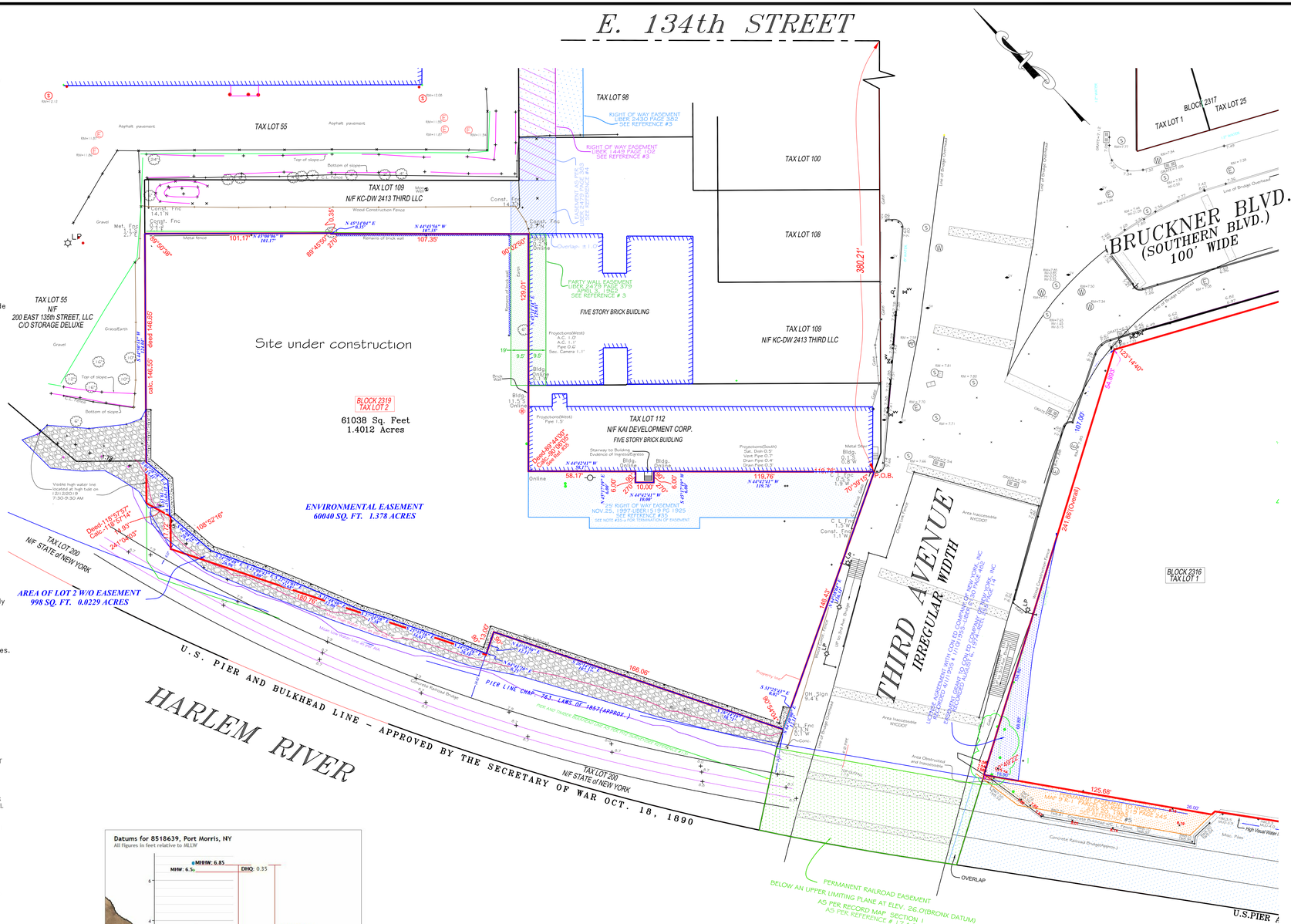
0ft 30ft 60ft 90ft

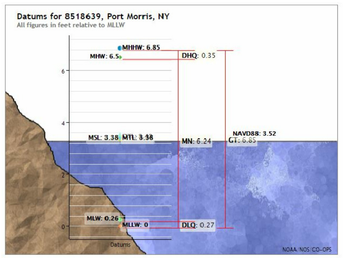
GRAPHIC SCALE

ALL MEASUREMENTS ARE U.S. SURVEY FEET

METRIC EQUIVILENT

0m 9.144m 18.288m 27.432m





MEAN HIGH WATER ELEVATION: 2.98(NAVD88)

DIAGRAM ABOVE IS FOR DATUMS FOR STATION #8518639, PORT MORRIS, NY. DIAGRAM WAS OBTAINED FROM THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION(NOAA). ALL FIGURES ON NOAA CHART ARE RELATED TO THE STATION ONLY WITH MEAN LOW WATER(MLLW) = 0.00'. THEREFORE THE NAVD88 ELEVATION OF THE MEAN HIGH WATER(MHW) CAN BE DERIVED BY THE MHW - NAVD88(STATION)=NAVD88 ELEVATION OF MHW.

MHW(STATION)	6.50
NAVD88(STATION)	- 3.52
NAVD88 ELEVATION(MHW)	2.98

ELEVATION DATUM CONVERSIONS

NAVD88	NGVD29	BRONX
0.00	+1.10	-1.508

THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL EASEMENT HELD BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION PURSUANT TO TITLE 36 OF ARTICLE 71 OF THE NEW YORK ENVIRONMENTAL CONSERVATION LAW.THE ENGINEERING AND INSTITUTIONAL CONTROLS FOR THIS EASEMENT ARE SET FORTH IN THE SITE MANAGEMENT PLAN (SMP). A COPY OF THE SMP MUST BE OBTAINED BY ANY PARTY WITH INTEREST IN THE PROPERTY. THE SMP CAN BE OBTAINED FROM THE NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF ENVIRONMENTAL REMEDIATION, SITE CONTROL SECTION. 625 BROADWAY, ALBANY, NY 12233 OR AT DERWEB@DEC.NY.GOV.

LEGEND

- SPOT ELEVATION
- TREE
- BOLLARD
- FIRE HYDRANT
- GAS VALVE
- WATER VALVE
- STREET SIGN
- UTILITY POLE
- LP LIGHT POLE
- SEWER MANHOLE
- DRAIN MANHOLE (ROUND)
- DRAIN MANHOLE (SQUARE)
- BORING
- MONITORING WELL
- OIL FILL VALVE
- VISIBLE HIGH WATER LINE ELEVATIONS AS OBSERVED ON BULKHEAD WALL DATE 0/0/20 & 2/1/2018
- TELEPHONE MANHOLE
- UNKNOWN MANHOLE
- DRAIN INLET
- CATCH BASIN
- UNKNOWN VALVE
- ELECTRIC BOX
- ELECTRIC MANHOLE
- FLAG POLE
- GROUND PENETRATION RADAR W/DEPTH IN FEET
- METAL FENCE
- WOOD FENCE
- CHAIN LINK FENCE
- PROPERTY LINE
- BULKHEAD LINE
- DEBRIS LINE
- WATER PIPE UNDERGROUND
- SEWER PIPE UNDERGROUND
- FLOW DIRECTION

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. ABSENCE OR EXISTENCE OF UTILITIES DOWS NOT DENY THE EXISTENCE OF THE SAME. CONTRACTOR IS ADVISED TO COMPLY WITH INDUSTRIAL CODE RULE 53, TEST PITS IN AREAS OF CONSTRUCTION MAY BE NEEDED TO VERIFY UTILITIES.

THE SURVEYOR HAS LOCATED AND DOCUMENTED THE CONDITIONS OF THE SURFACE OF THE SITE AT THE TIME OF SURVEY. FURTHERMORE, THE SURVEYOR CANNOT CONFIRM THE CONDITIONS OF THE EARTH BELOW THE CURRENT CONDITIONS. NO TEST HOLES OR BORINGS WERE COMPLETED AT THE TIME OF SURVEY.

LEGAL DESCRIPTION Block 2319 Lot 2-as per schedule A in Title report 18-7406-51463-B-002

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough and County of Bronx, City and State of New York, bounded and described as follows:

BEGINNING at a point on the westerly side of Third Avenue, 380.21 southwesterly from the corner formed by the Intersection of the Westerly side of Third Avenue and the southerly side of East 134th. Street;

RUNNING THENCE northwesterly along a course forming an interior angle of 70 degrees 39 minutes 15 seconds with the northwesterly side of Third Avenue 119.76 feet to a point;

THENCE southwesterly at right angles to the last mentioned course, 6.00 feet to a point;

THENCE northwesterly at right angles to the last mentioned course 10.00 feet to a point;

THENCE northeasterly at right angles to the last mentioned course, 6.00 feet to a point;

THENCE northwesterly at right angles to the last mentioned course, 58.17 feet to a point;

THENCE northeasterly along a line forming an interior angle of 89 degrees 44 minutes 00 seconds (Calc'd 90° 06' 05")on its easterly side with last mentioned course 129.01 feet to a point;

THENCE northwesterly along a line forming an interior angle of 90 degrees 02 minutes 50 seconds on its southerly side with the last mentioned course 107.35 feet to a point;

THENCE northeasterly at right angles to the last mentioned course 0.35 feet to a point;

THENCE northwesterly along a line forming an interior angle of 89 degrees 45 minutes 50 seconds on its southerly side with the last mentioned course 101.17 feet to the southerly side of Mott Haven Canal;

THENCE southwesterly along the southeasterly side of Mott haven Canal, 146.65(Calc'd 146.55 feet) feet to a point:

THENCE southeasterly forming an interior angle of 118 degrees 57 minutes 57 seconds(Calc'd-118° 57' 14") with the last mentioned course a distance of 14.93 feet to a point;

THENCE southerly forming an interior angle of 241 degrees 4 minutes 3 seconds with the last mentioned course a distance of 17.72 feet to a point;

THENCE southeasterly forming an interior angle of 108 degrees 52 minutes 16 seconds with the last mentioned course a distance of 180.76 feet to a point;

THENCE northeasterly at right angles to the last mentioned course a distance of 13.00 feet to a point;

THENCE southeasterly at right angles to the last mentioned course a distance of 166.06 feet to the northwesterly side of Third Avenue;

THENCE northeasterly along the northwesterly side of Third Avenue 148.43 feet to the point or place of BEGINNING.

Said parcel containing 61038 SF. or 1.40 acres.

TOGETHER with the benefits of certain easements as to gas, electricity, and water described in deed between Richard C. Mugler and Kai Development Corp. recorded December 30, 1997 in Reel 1519 page 1925.

TOGETHER with the benefits of a non-exclusive right of way for ingress, egress and regress with the right to pass and repass on foot and with animals and vehicles, for the non-exclusive use in common with others as reserved and described in deed made by Canal & 3rd Co, and Mae - Joe Realty Corp. Inc. recorded in Liber 2479 at Page 383.

NO.	DATE	DESCRIPTION	APPR'D.
3	8/18/20	Added Desc./notes	J.G.P.
2	5/20/20	Added easement area	G.R.S.
1	5/18/20	Remove Desc./notes	G.R.S.

REVISIONS

DRAWN BY: G.R.S. 04/30/2020
CHECKED BY: J.G.P. 05/01/2020
SCALE : 1"=30'
SURVEYED DATE:APR/2020
JOB # : 18-0344
SHEET NO: 1 OF 1

ENVIRONMENTAL EASEMENT SURVEY
2401 THIRD AVENUE
BRONX, NEW YORK

HIRANI ENGINEERING & LAND SURVEYING, P.C.
120 WEST JOHN STREET
HICKSVILLE, NEW YORK 11801
T (516) 248-1010 F (516) 248-9018
Hirani Group

I HEREBY DECLARE THAT THIS SURVEY HAS BEEN PREPARED UNDER MY RESPONSIBLE CHARGE AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DIMENSIONS AND INFORMATION ARE CORRECT AS TO THE DETAIL SHOWN.

JOSEPH G. PIKE, LS

N.Y.S. PROFESSIONAL LAND SURVEYOR, LIC. No. 050580

STATE OF NEW YORK JOSEPH G. PIKE 050580 LICENSED LAND SURVEYOR

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THENCE S 45°17'19" W a distance of 6.00'to a point;

THENCE N 44°42'41" W a distance of 10.00'to a point;

THENCE N 45°17'19" E a distance of 6.00'to a point;

THENCE N 44°42'41" W a distance of 58.17'to a point;

THENCE N 45°11'14" E a distance of 129.02'to a point;

THENCE N 44°45'56" W a distance of 107.35'to a point;

THENCE N 45°14'04" E a distance of 0.35'to a point;

THENCE N 45°00'06" W a distance of 101.17'to the southerly side of Mott Haven Canal;

THENCE S 44°50'33" W a distance of 124.04'to a point on the northerly side of bulkhead;

THENCE following the westerly side of bulkhead the following 16 coarses;

THENCE S 04°28'38" E a distance of 15.41'to a point;

THENCE S 41°49'33" W a distance of 19.15'to a point;

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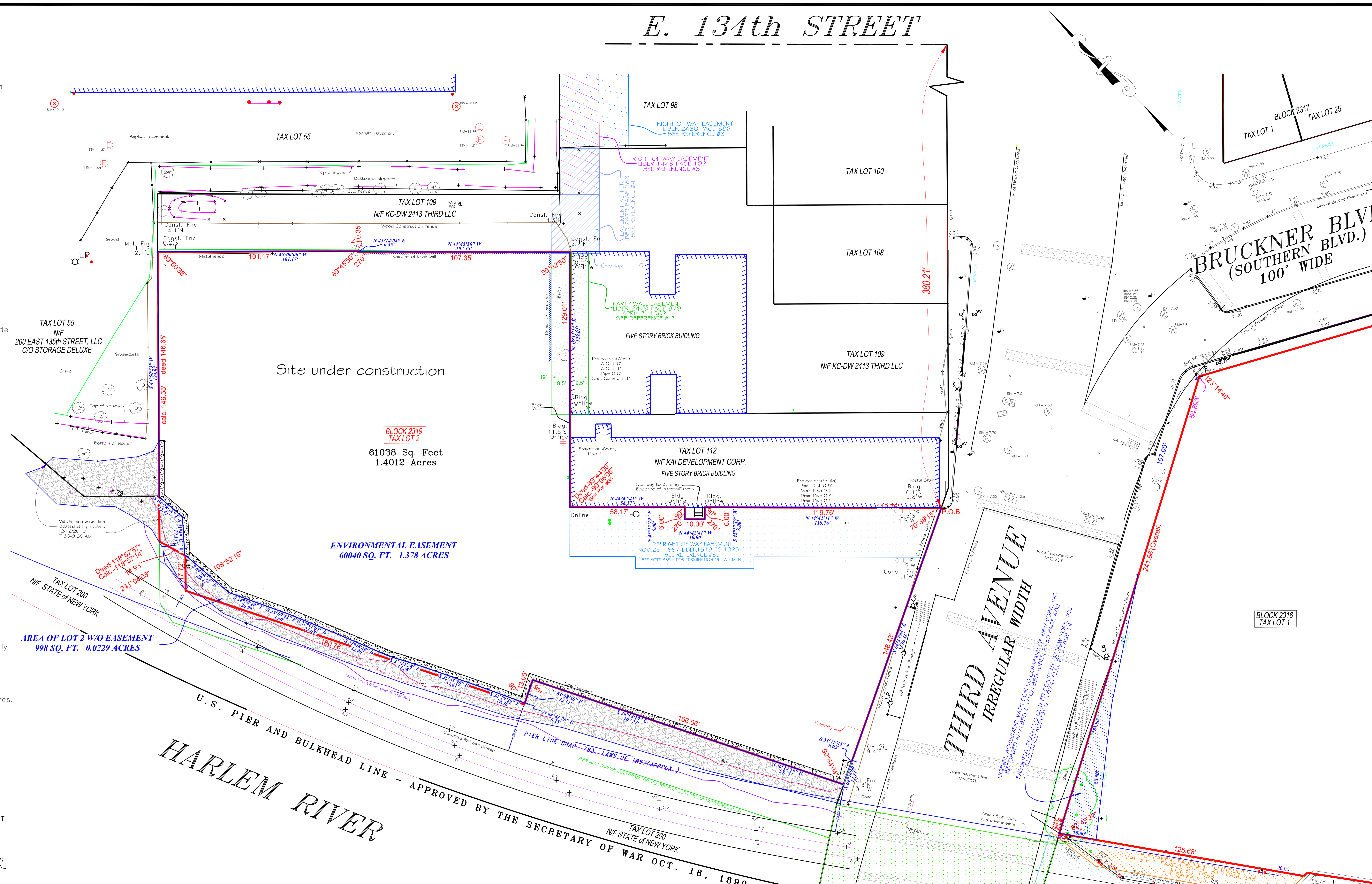
THENCE N 64°40'00" E a distance of 12.11'to a point;

THENCE S 31°25'43" E a distance of 0.02'to a point at the end of southerly side of bulkhead and the North side of Third Avenue;

THENCE N 64°38'04" E a distance of 136.31'to the point or place of BEGINNING;

Aboved described parcel having an area of 60039.5 square feet, 1.378 acres.



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GENERAL NOTES

1. HORIZONTAL DATUM IS ASSUMED.

2. VERTICAL DATUM IS NAVD88 AS ESTABLISHED UTILIZING THE NYSDOT NYSNET GPS RTN NETWORK.

3. THE INFORMATION SHOWN HEREON CORRECTLY REPRESENTS THE CONDITIONS FOUND AT AND AS OF THE DATE OF THE FIELD SURVEY.

4. SUBJECT TO EASEMENTS AND RESTRICTIONS THAT MAY EXIST AS SHOWN IN TITLE REPORT #18-7406-51463-B-002, INCLUDING BUT NOT LIMITED TO: AGREEMENTS, BOUNDARY LINE AND THE LIKE, WRITTEN AND/OR IMPLIED; CLAIMS; CONTRACTS; EASTMENTS; GRANTS; LEASES; LICENSES; LIMITATIONS; MATTER OF FACT; RESERVATIONS; RIGHTS, AERIAL AND/OR SUBTERRANEAN; UNWRITTEN TRANSFERS OR CLAIMS; WELANDS AND/OR ENVIRONMENTAL STUDIES; MUNICIPAL/COUNTY/STATE AND/OR FEDERAL LAWS, ORDINANCES, REGULATIONS, REQUIREMENTS AND RULES, SPECIFICALLY THOSE CONDITIONS PLACED UPON THIS PARCEL THROUGH THE SUBDIVISION PROCESS AND FOUND IN THE BOROUGH OF BRONX APPROVAL RESOLUTION. EASEMENTS NOT SUPPLIED IN TITLE REPORT NOT GUARANTEED.

5. UNLESS OTHERWISE NOTED, LOT AND BLOCK DESIGNATIONS ARE IN ACCORDANCE WITH THE CURRENT TAX MAP OF THE BOROUGH OF BRONX, CITY, COUNTY AND STATE OF NEW YORK, FOR BLOCKS 2316 AND 2319.

6. ALL DIMENSIONS SHOWN ARE IN THE LEGAL OR BLOCK STANDARD OF MEASURMENT AND ARE TO BE USED FOR LEGAL DESCRIPTIONS AND COMPUTATIONS OF THE AREA OF THE LOT. THEY ARE NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

7. SEEK LEGAL ADVICE REGARDING ANY DISCREPANCIES SHOWN ON THIS SURVEY. DISCREPANCIES INCLUDE DIFFERENCES BETWEEN THE WRITTEN RECORD AND THE FIELD EVIDENCE, AS WELL AS, GAPS, OVERLAPS, AND ENCROACHMENTS.

8. THERE ARE NO VISABLE STREAMS NOR NATURAL WATER COURSES IN THE PROPERTY AS SHOWN ON THIS SURVEY. THERE ARE WATER COURSES ADJOINING THE PARCEL.

9. PROPERTY LOCATED IN FEMA FLOOD ZONE AE 11 AS SHOWN ON MAP NUMBER 3604970091F, PANEL 91 OF 457 REVISED SEPTEMBER 5, 2007.

10. PROPERTY ZONING DESIGNATION TO BE DETERMINED.

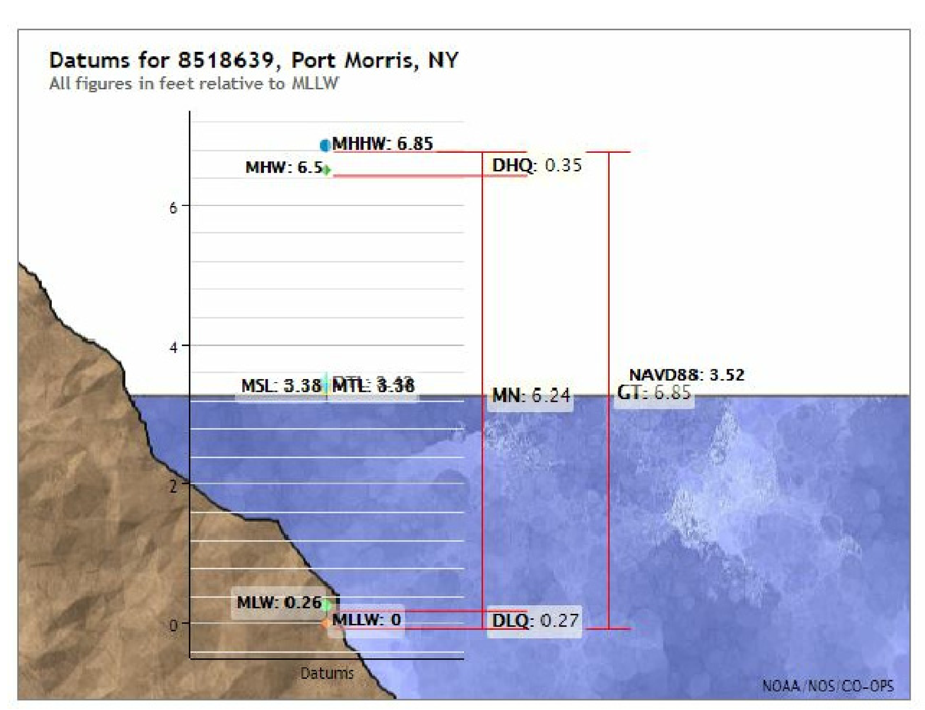
11. NO MONUMENTS HAVE BEEN SET.

12. NO HYDROGRAPHIC SURVEY PERFORMED FOR THIS SURVEY.

LAND SITUATED IN THE
COUNTY OF BRONX
CITY OF NEW YORK
STATE OF NEW YORK
AS
BLOCK 2319 LOT 2

0ft 30ft 60ft 90ft
GRAPHIC SCALE
ALL MEASUREMENTS ARE U.S. SURVEY FEET

METRIC EQUIVILENT
0m 9.144m 18.288m 27.432m



MEAN HIGH WATER ELEVATION: 2.98(NAVD88)

DIAGRAM ABOVE IS FOR DATUMS FOR STATION #8518639, PORT MORRIS, NY. DIAGRAM WAS OBTAINED FROM THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION(NOAA). ALL FIGURES ON NOAA CHART ARE RELATED TO THE STATION ONLY WITH MEAN LOW LOW WATER(MLLW) = 0.00'. THEREFORE THE NAVD88 ELEVATION OF THE MEAN HIGH WATER(MHW) CAN BE DERIVED BY THE MHW - NAVD88(STATION)=NAVD88 ELEVATION OF MHW.

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LEGEND

SPOT ELEVATION, TREE, BOLLARD, FIRE HYDRANT, GAS VALVE, WATER VALVE, STREET SIGN, UTILITY POLE, LIGHT POLE, SEWER MANHOLE, DRAIN MANHOLE (ROUND), DRAIN MANHOLE (SQUARE), BORING, MONITORING WELL, OIL FILL VALVE, VISIBLE HIGH WATER LINE ELEVATIONS AS OBSERVED ON BULKHEAD WALL DATE 09/06 & 2/1/2018

TELEPHONE MANHOLE, UNKNOWN MANHOLE, DRAIN INLET, CATCH BASIN, UNKNOWN VALVE, ELECTRIC BOX, ELECTRIC MANHOLE, FLAG POLE, GROUND PENETRATION RADAR W/DEPTH IN FEET, METAL FENCE, WOOD FENCE, CHAIN LINK FENCE, PROPERTY LINE, BULKHEAD LINE, DEBRIS LINE, WATER PIPE UNDERGROUND, SEWER PIPE UNDERGROUND, FLOW DIRECTION

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. ABSENCE OR EXISTENCE OF UTILITIES DOWS NOT DENY THE EXISTENCE OF THE SAME. CONTRACTOR IS ADVISED TO COMPLY WITH INDUSTRIAL CODE RULE 53, TEST PITS IN AREAS OF CONSTRUCTION MAY BE NEEDED TO VERIFY UTILITIES.

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NO.	DATE	DESCRIPTION	APPR'D.
3	8/18/20	Added Desc./notes	J.G.P.
2	5/20/20	Added easement area	G.R.S.
1	5/18/20	Remove Desc./notes	G.R.S.

REVISIONS

DRAWN BY: G.R.S. 04/30/2020
CHECKED BY: J.G.P. 05/01/2020
SCALE : 1"=30'
SURVEYED DATE:APR/2020
JOB # : 18-0344
SHEET NO: 1 OF 1

ENVIRONMENTAL EASEMENT SURVEY
2401 THIRD AVENUE
BRONX, NEW YORK

HIRANI ENGINEERING &
LAND SURVEYING, P.C.
120 WEST JOHN STREET
HICKSVILLE, NEW YORK 11801
T (516) 248-1010 F (516) 248-9018
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STATE OF NEW YORK · JOSEPH G. PIKE · 050580 · LICENSED LAND SURVEYOR

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Above described parcel having an area of 60039.5 square feet, 1.378 acres.

APPENDIX B

List of Site Contacts

APPENDIX B – LIST OF SITE CONTACTS

Name	Phone/Email Address
Site Owner: BOP 2401 Third Avenue, LLC	(212) 417-7000 ralph.toussie@brookfieldproperties.com
Owner Representatives: Eileen Weingarten	(212) 417-7208 Eileen.Weingarten@brookfieldproperties.com
Remedial Party: BOP 2401 Third Avenue, LLC	(212) 417-7000 ralph.toussie@brookfieldproperties.com
Qualified Environmental Professional: Noelle Clarke, P.E. Roux Environmental Engineering and Geology, D.P.C.	(631) 232-2600 (Office) nclarke@rouxinc.com
NYSDEC, DER, Bureau of Technical Support Site Control Section	Chief, Site Control Section New York State Department of Environmental Conservation Division of Environmental Remediation 625 Broadway Albany NY 12233-7020
NYSDEC Project Manager: Mandy Yau, NYSDEC	Mandy.Yau@dec.ny.gov
Chief, NYSDEC, Superfund and Brownfield Cleanup Section: Jane O'Connell, NYSDEC	jane.oconnell@dec.ny.gov
NYSDOH Project Manager: Steven Berninger	Steven.Berninger@health.ny.gov
Attorney: David Yudelson	(646) 378-7219 dyudelson@sprlaw.com

APPENDIX C

Soil Boring and Monitoring Well Construction Logs

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B1 Boring Log

Location: 180' from Lot 112 (N), 240' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		5	Well Specifications
Date Started: 11/24/2015	Date Completed: 11/24/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B1 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	6		0.0	6" - Brown coarse soil matrix with wood **Retained soil sample 15B1(0-2)*
	5 to 10	7		0.0	7" - Brown coarse matrix **Retained soil sample 15B1(5-7)*
	10 to 15	38		0.0	18" - Black coarse matrix with coal 20" - Black to gray clay w/ sulfur odor

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B2 Boring Log

Location: 115' from Lot 112 (N), 190' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/24/2015	Date Completed: 11/24/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B2 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	30		0.0	2" - Concrete 28" - Brown silt w/ coal
	5 to 10	27		0.0	5" - Brown sand 22" - Gray sand **Retained soil sample 15B2(6-8)*
	10 to 15	15		0.0	15" - Brown sand

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B3 Boring Log

Location: 135' from Lot 112 (N), 195' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		5	Well Specifications
Date Started: 11/24/2015	Date Completed: 11/24/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B3 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	44		0.0	40" - Brown silt with coal and brick 4" - Brown silt **Retained soil sample 15B3(0-2)*
	5 to 10	32		227.3	2" - Brown coarse matrix 30" Coal with petrol odor **Retained soil sample 15B3(5-7)*
	10 to 15	26		18.8	8" - Gray sand w/ PID 18.8 18" - Brown sand w/ PID 0.0 **Retained soil sample 15B3(13-15)*
	15 to				

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B4 Boring Log

Location: 130' from Lot 112 (N), 130' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/24/2015	Date Completed: 11/24/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B4 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0				
	to 5	28		0.0	2" - Concrete 26" - Brown silt w/ coal **Retained soil sample 15B4(0-2)*
	to 10	38		426.5	8" - Brown silt w/ PID 0.0 10" - Black stained silt w/ petrol odor; PID 426.5 20" - Gray silt w/ PID 4.2 **Retained soil sample 15B4(6-8)*
	to 15	29		1.2	13" - Gray sand 16" - Brown sand **Retained soil sample 15B4(10-12)*

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B5 Boring Log

Location: 130' from Lot 112 (N), 165' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/24/2015	Date Completed: 11/24/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B5 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	36		0.0	35" - Brown silt w/ coal and brick 1" - Brown silt
	5 to 10	28		4.3	14" - Brown coarse matrix 14" - Brown sand w/ shells **Retained soil sample 15B5(6-8)*
	10 to 15	15		0.0	15" - Brown sand
	15				

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B6 Boring Log

Location: 25' from Lot 112 (N), 60' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/19/2015	Date Completed: 11/19/2015			None
Completion Depth: 15 feet	Geologist Kevin Waters			

15B6 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0				
	to 5	40		0.0	40" - dark brown / black dry to moist sandy fill with brick, coal and gravel **Retained soil sample 15B6(3-5)*
	to 10	18		0.0	11" - dark brown / black sandy fill with large pieces of coal 7" - gray clay with peat and wood
	to 15	20		0.0	13" - Gray clay 7" - Dark gray medium sand w/ organic odor **Retained soil sample 15B6(10-12)*

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B7 Boring Log

Location: 70' from Lot 112 (N), 125' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/19/2015	Date Completed: 11/19/2015			None
Completion Depth: 15 feet	Geologist Kevin Waters			

15B7 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	36		0.0	36" - brown/black med grain sandy fill w/ rocks and coal. Moist to wet
	5 to 10	24		0.0	13" - brown/black sandy fill saturated @ 6-13" 11" - gray clay w/ brick fragment and shells **Retained soil sample 15B7(6-8)*
	10 to 15	40		0.0	40" - Gray clay

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B8 Boring Log

Location: 60' from Lot 112 (N), 40' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/19/2015	Date Completed: 11/19/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B8 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	Blow per 6 in.	PID (ppm)	SOIL DESCRIPTION
	0 to 5	48		0.0	11" - Dark brown silt w/ rocks 28" - Black silt w/ coal and brick 9" - Black clay / silt
	5 to 10	38		0.0	2" - Brown silt 32" - Gray clay 4" - Coal **Retained soil sample 15B8(6-8)*
	10 to 15	11		0.0	11" - Gray clay

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B9 Boring Log

Location: 110' from Lot 112 (N), 50' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/19/2015	Date Completed: 11/19/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B9 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	31		0.0	6" - Brown sand w/ rock 5" - Dark brown clay 7" - Brown sand 13" - Black clay **Retained soil sample 15B9(0-2)*
	5 to 10	17		0.0	3" - brown sand 14" - dark gray clay w/ gw **Retained soil sample 15B9(6-8)*
	10 to 15	31		0.0	31" - dark gray clay

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B10 Boring Log

Location: 80' from Lot 112 (N), 175' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/19/2015	Date Completed: 11/19/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B10 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	27		0.0	2" - Concrete 8" - Brown silt and coal 17" - Brown silt with coal and brick **Retained soil sample 15B10(3-5)*
	5 to 10	15		0.0	15" - Brown silt w/ coal **Retained soil sample 15B10(6-8)*
	10 to 15	34		0.0	34" - Gray / Black clay

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B11 Boring Log

Location: 175' from Lot 112 (N), 280' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		7	Well Specifications
Date Started: 11/23/2015	Date Completed: 11/23/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B11 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	46		4.2	43" - Brown/Black silty sand with fill 3" - Brown clay **Retained soil sample 15B11(0-2)*
	5 to 10	41		0.0	20" - Brown sand and silt 21" - Black silt **Retained soil sample 15B11(6-8)*
	10 to 15	6		0.0	6" - Black coarse sand

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B12 Boring Log

Location: 170' from Lot 112 (N), 320' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		7	Well Specifications
Date Started: 11/23/2015	Date Completed: 11/23/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B12 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	33		0.0	3" - Concrete 6" - Gray sand with brick 24" - Brown silt with coal
	5 to 10	12		0.0	8" - Rock 4" - Black sand **Retained soil sample 15B12(6-8)*
	10 to 15	27		0.0	27" - Brown to black sand and silt

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B13 Boring Log

Location: 170' from Lot 112 (N), 320' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/20/2015	Date Completed: 11/20/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B13 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0				
	to 5	35		0.0	2" - Wood and brown silt 33" - Brown silt with coal **Retained soil sample 15B13(0-2)*
	to 10	29		0.0	3" - Brown sand 26" - Tan sand, wet **Retained soil sample 15B13(6-8)*
	to 15	57		0.0	20" - Gray sand 6" - Tan sand 31" - Gray clay

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B14 Boring Log

Location: 120' from North, 25' from West			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		5	Well Specifications
Date Started: 11/20/2015	Date Completed: 11/20/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B14 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	38		0.0	8" - Gray silt with coal and brick 30" - Brown silt with brick
	5 to 10	6		0.0	6" - Brown silt with coal **Retained soil sample 15B14(5-7)*
	10 to 15	16		0.0	16" - Gray wet clay

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B15 Boring Log

Location: 95' from South, 300' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/20/2015	Date Completed: 11/20/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B15 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	30		0.0	1" - Concrete 18" - Brown silt w/ coal and brick 11" - Brown sand
	5 to 10	12		0.0	12" - Gray / brown silt w/ fill material **Retained soil sample 15B15(6-8)*
	10 to 15	18		0.0	9" - Brown / gray sand 9" - Tan sand

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B16 Boring Log

Location: 120' from North, 255' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/19/2015	Date Completed: 11/19/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B16 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0				
	to 5	35		2.2	2" - Concrete 10" - Brown silt 23" - Dark brown silt with coal and brick **Retained soil sample 15B16(3-5)*
	to 10	41		1.9	24" - Dark brown silt w/ coal 17" - Black silt w/ coal **Retained soil sample 15B16(6-8)*
	to 15	26		0.0	24" - Gray clay 2" - Brown silt and clay

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B17 Boring Log

Location: 105' from North, 215' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/19/2015	Date Completed: 11/19/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B17 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	22		0.0	4" - Concrete 18" - Brown silt
	5 to 10	18		0.0	3" - Brown silt 6" - Dark brown organic material 9" - Brown silt **Retained soil sample 15B17(6-8)*
	10 to 15	8		0.0	8' - Brown sand

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B18 Boring Log

Location: 55' from south, 105' from West			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		7	Well Specifications
Date Started: 11/19/2015	Date Completed: 11/19/2015			None
Completion Depth: 15 feet	Geologist Thomas Gallo			

15B18 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	40		3.2	40" - Dark brown silt and sand w/ brick and rock **Retained soil sample 15B18(0-2)*
	5 to 10	20		0.0	2" - Crushed rock 18" - Brown sand **Retained soil sample 15B18(6-8)*
	10 to 15	18		0.0	18" - Brown sand, wet

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B19 Boring Log

Location: 20' from South, 215' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/20/2015	Date Completed: 11/20/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B19 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	29		0.0	2" - Concrete 27" - Brown silt and clay **Retained soil sample 15B19(0-2)*
	5 to 10	24		0.0	24" - Brown silt and sand **Retained soil sample 15B19(6-8)*
	10 to 15	26		0.0	26" - Brown sand

Geologic Boring Log Details

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS

15B20 Boring Log

Location: 20' from South, 300' from East			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		5.5	Well Specifications
Date Started: 11/20/2015	Date Completed: 11/20/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B20 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	17		0.0	2" - Concrete 13" - Brown silt with brick and coal 2" - Red / brown sand with rock
	5 to 10	17		0.0	15" - Rock 2" - Black wet sand **Retained soil sample 15B20(8-10)*
	10 to 15	10		0.0	5" - Black to gray silt 5" - Tan sand

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B21 Boring Log

Location: 50' from South, 50' from West			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/20/2015	Date Completed: 11/20/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B21 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0				
	to 5	24		0.0	4" - Rocks and silt 20" - Brown silt w/ brick
	to 10	26		0.0	2" - Brown silt 24" - Wet gray clay **Retained soil sample 15B21(6-8)*
	to 15	31		0.0	31" - Gray clay

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B22 Boring Log

Location: 60' from South, 15' from West			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		5.5	Well Specifications
Date Started: 11/20/2015	Date Completed: 11/20/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

15B22 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	23		0.0	5" - Brown silt w/ metal fill 18" - Brick and sand **Retained soil sample 15B22(0-2)*
	5 to 10	31		0.0	6" - Brown silt 25" - Black wet silt **Retained soil sample 15B22(6-8)*
	10 to 15	8		0.0	8" - Black wet silt

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

15B23 Boring Log

Location: 10' from South, 25' from West			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: Former Mugler Shoring Inc	Address: 2401 3rd Avenue, Bronx NY		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: C^2 Environmental	Method: Geoprobe		6	Well Specifications
Date Started: 11/20/2015	Date Completed: 11/20/2015			None
Completion Depth: 15 feet	Geologist Greg Swirson			

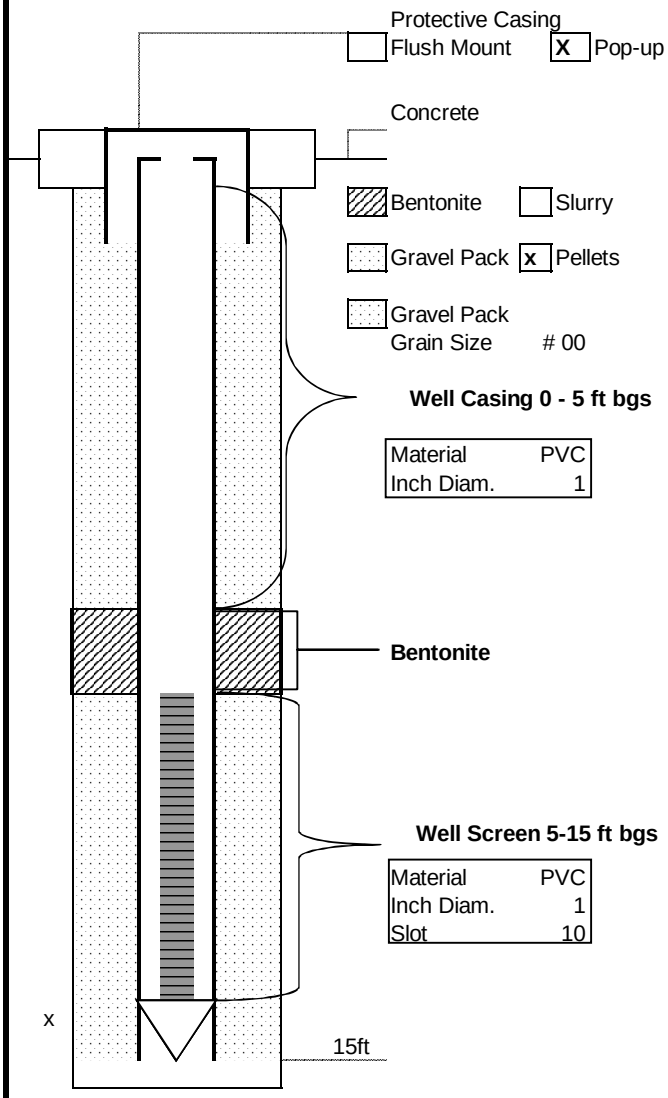
15B23 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0				
	to 5	40		63.9	8" - Coal 6" - Brown silt 20" -Brown silt w/ coal with wood 6" - Brown sand **Retained soil sample 15B23(2-4)*
	to 10	33		1.5	3" - White sand 30" - Gray clay **Retained soil sample 15B23(6-8)*
	to 15	25		0.0	25" - Gray silt, saturated

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW1



Note: Drawing is not to scale.
Depths are given in feet below land surface.

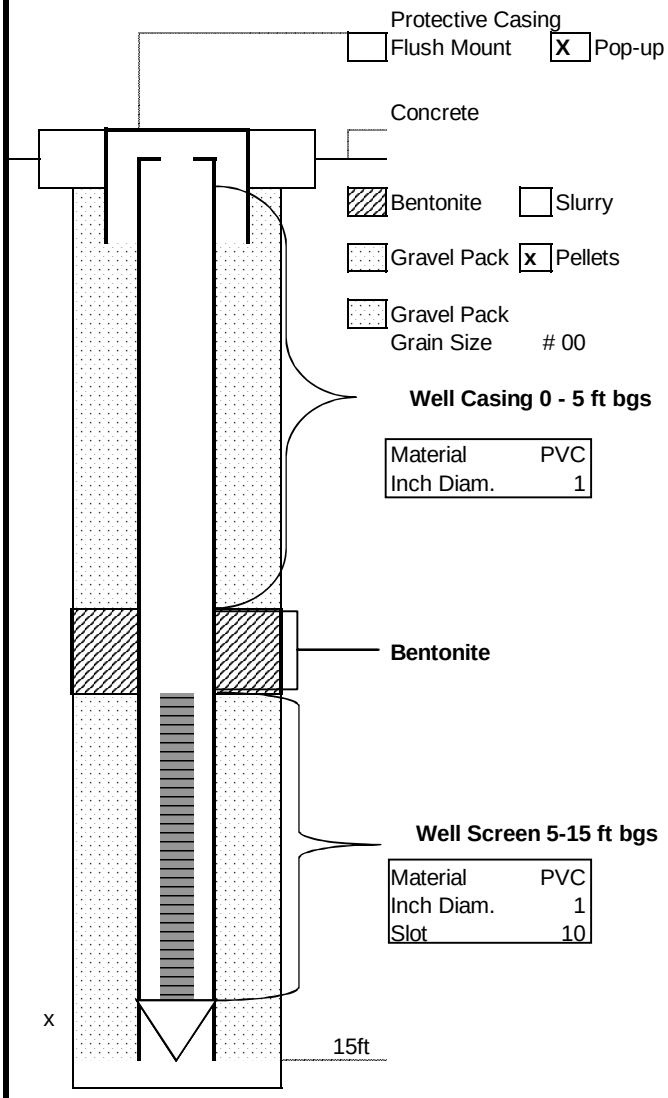
Monitoring Well No.:	MW1
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	6.03' Date: 12/1/2015
Installation Depth:	15ft bg
Survey Point Elevation:	
Installation Date:	11/24/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW2



Note: Drawing is not to scale.
Depths are given in feet below land surface.

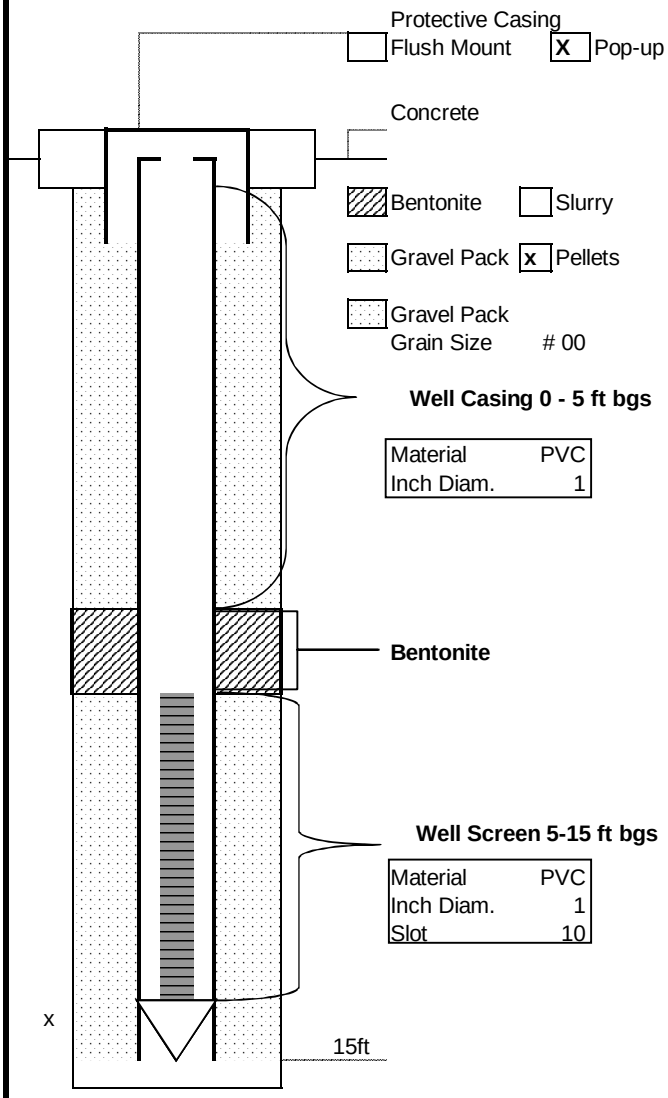
Monitoring Well No.:	MW2
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	5.45' Date: 12/1/2015
Installation Depth:	15ft bg
Survey Point Elevation:	
Installation Date:	11/24/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW3



Note: Drawing is not to scale.
Depths are given in feet below land surface.

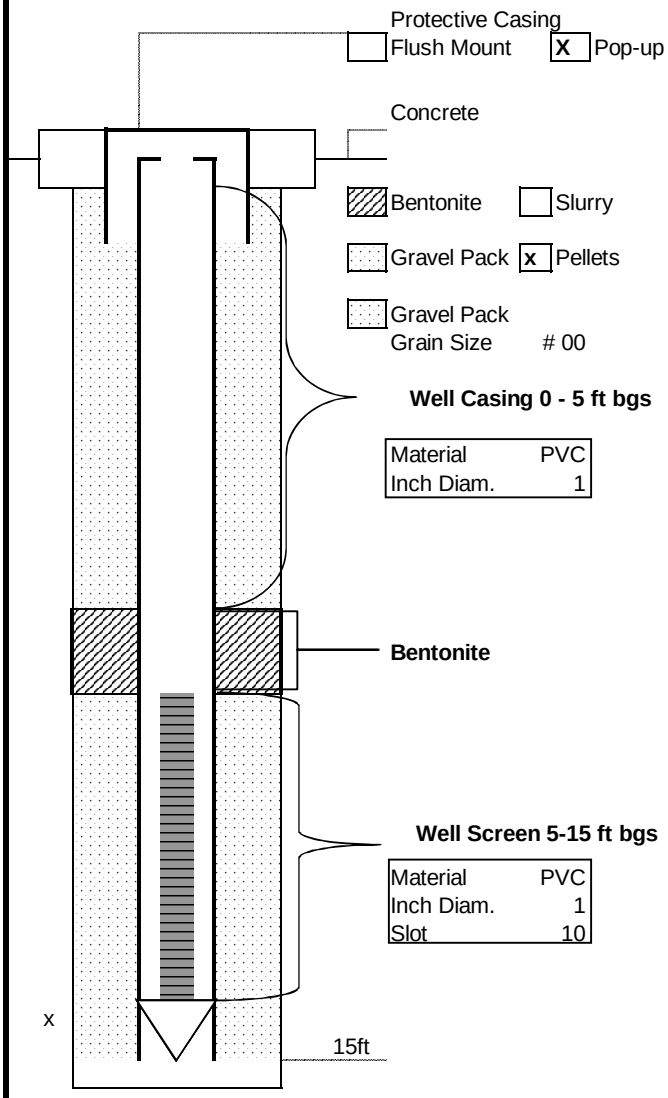
Monitoring Well No.:	MW3
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	6.55 Date: 12/2/2015
Installation Depth:	15ft bg
Survey Point Elevation:	
Installation Date:	11/24/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW4



Note: Drawing is not to scale.
Depths are given in feet below land surface.

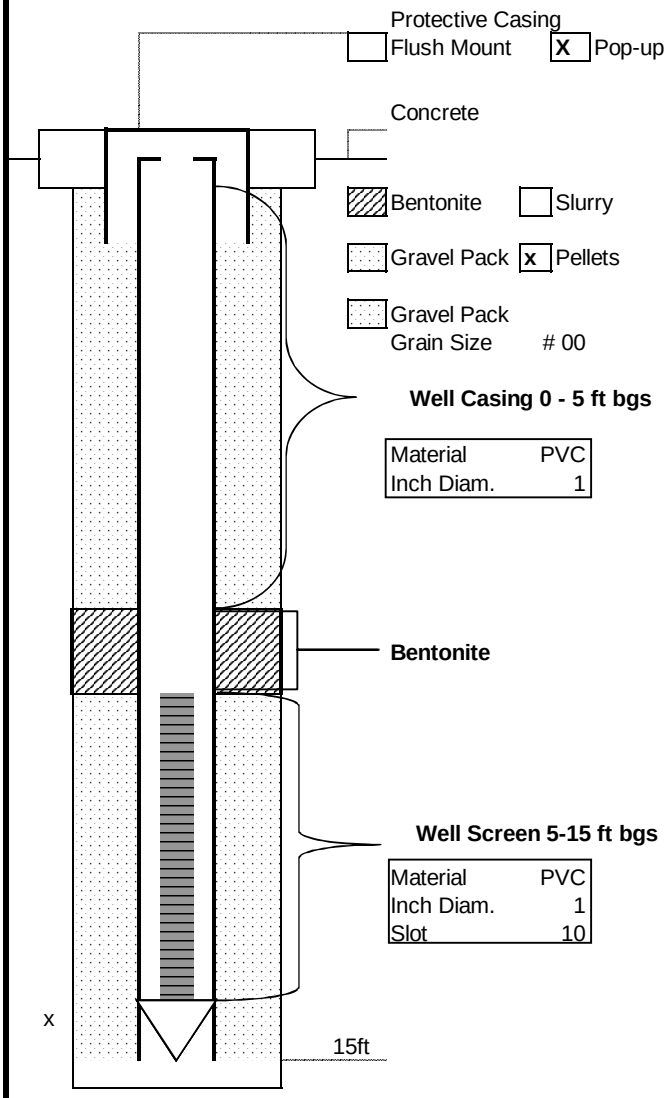
Monitoring Well No.:	MW4
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	6.75' Date: 12/2/2015
Installation Depth:	15ft bg
Survey Point Elevation:	
Installation Date:	11/24/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW5



Note: Drawing is not to scale.
Depths are given in feet below land surface.

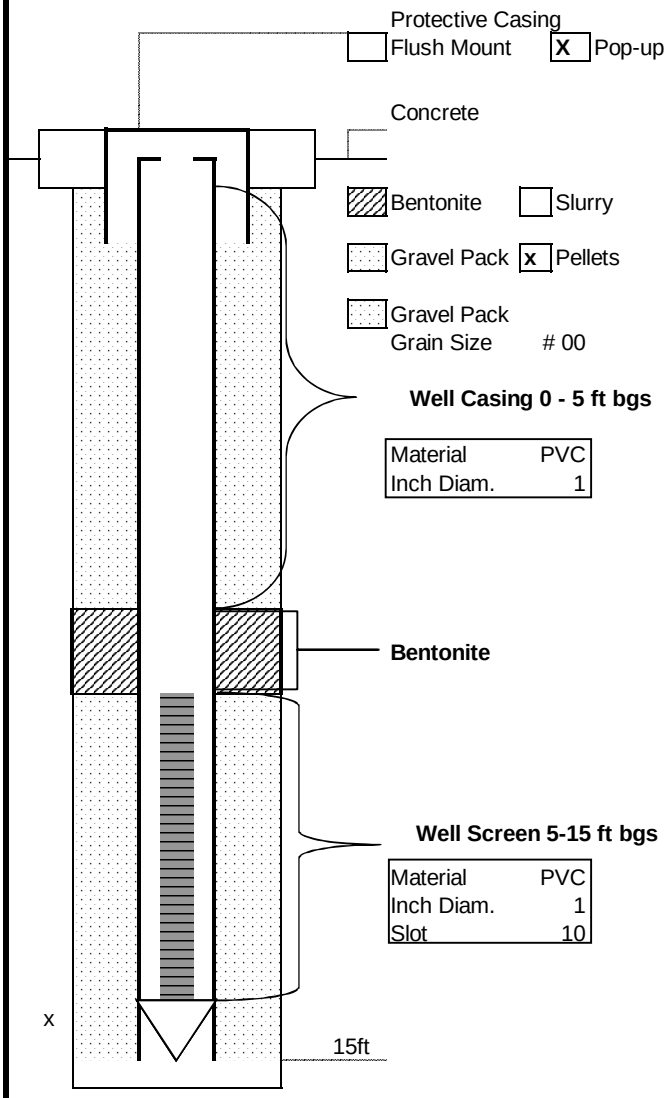
Monitoring Well No.:	MW5
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	5.17' Date: 12/2/2015
Installation Depth:	15ft bg
Survey Point Elevation:	
Installation Date:	11/24/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW7



Note: Drawing is not to scale.
Depths are given in feet below land surface.

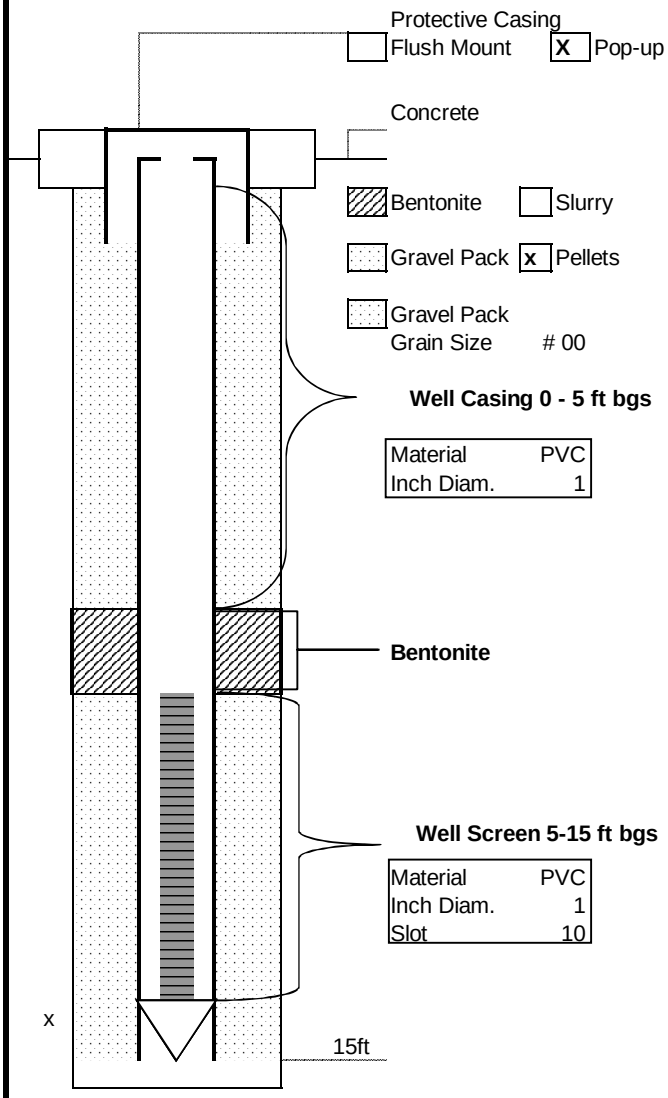
Monitoring Well No.:	MW7
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	5.53' Date: 12/2/2015
Installation Depth:	15ft bg
Survey Point Elevation:	
Installation Date:	11/20/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW8



Note: Drawing is not to scale.
Depths are given in feet below land surface.

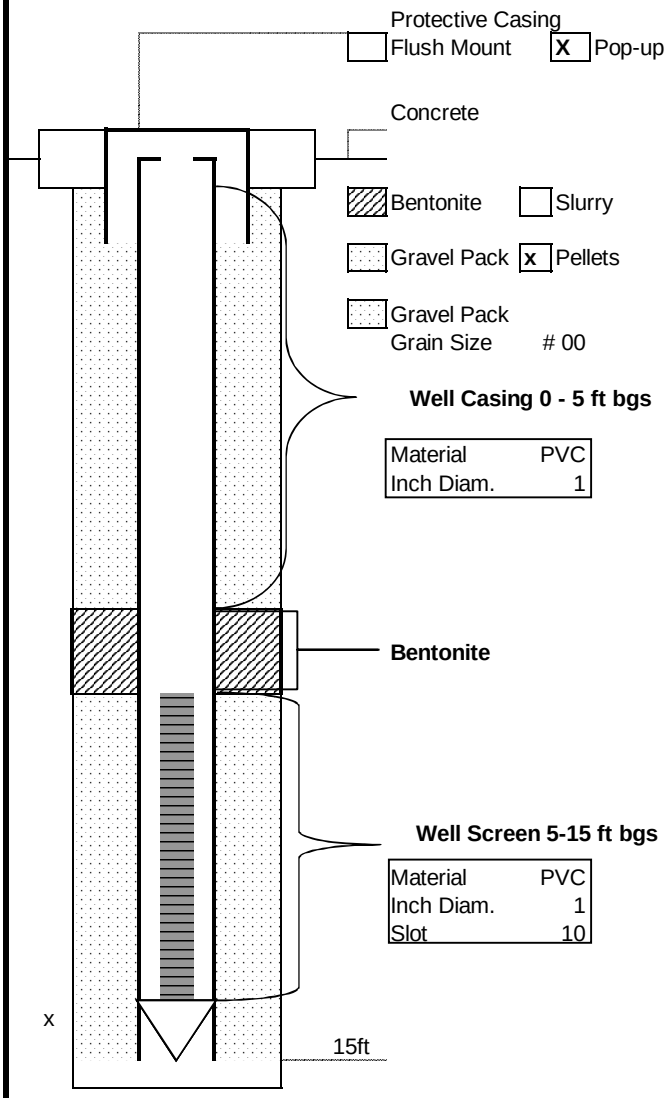
Monitoring Well No.:	MW8
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	5.49' Date: 12/2/2015
Installation Depth:	15ft bg
Survey Point Elevation:	
Installation Date:	11/23/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW9



Note: Drawing is not to scale.
Depths are given in feet below land surface.

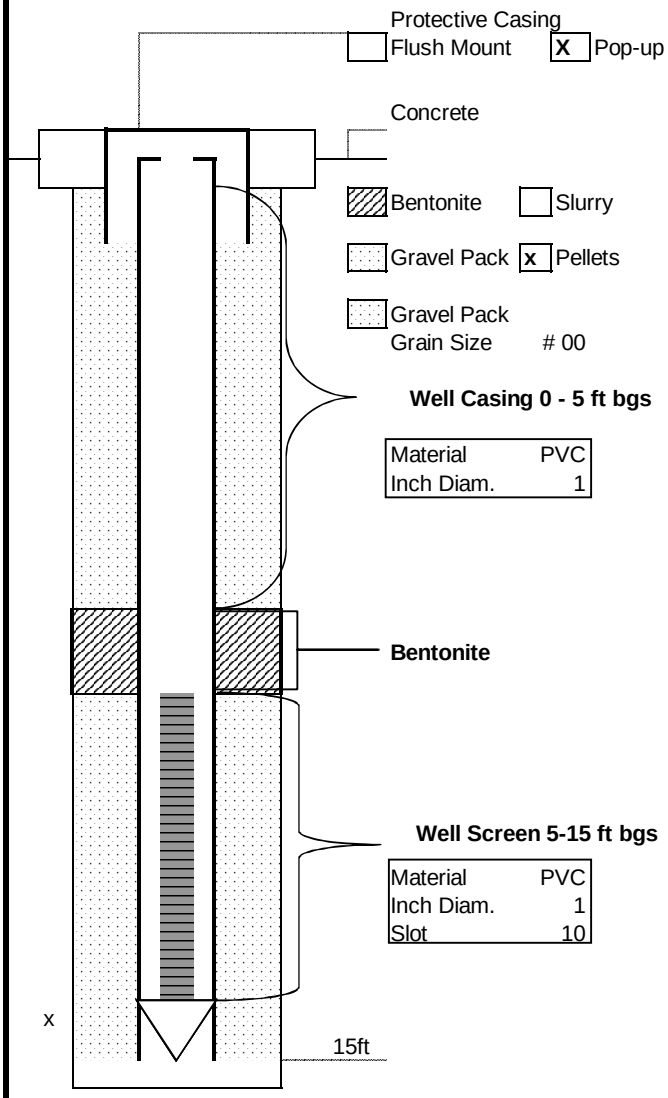
Monitoring Well No.:	MW9
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	5.91' Date: 12/2/2015
Installation Depth:	15ft bg
Survey Point Elevation:	
Installation Date:	11/24/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW10



Note: Drawing is not to scale.
Depths are given in feet below land surface.

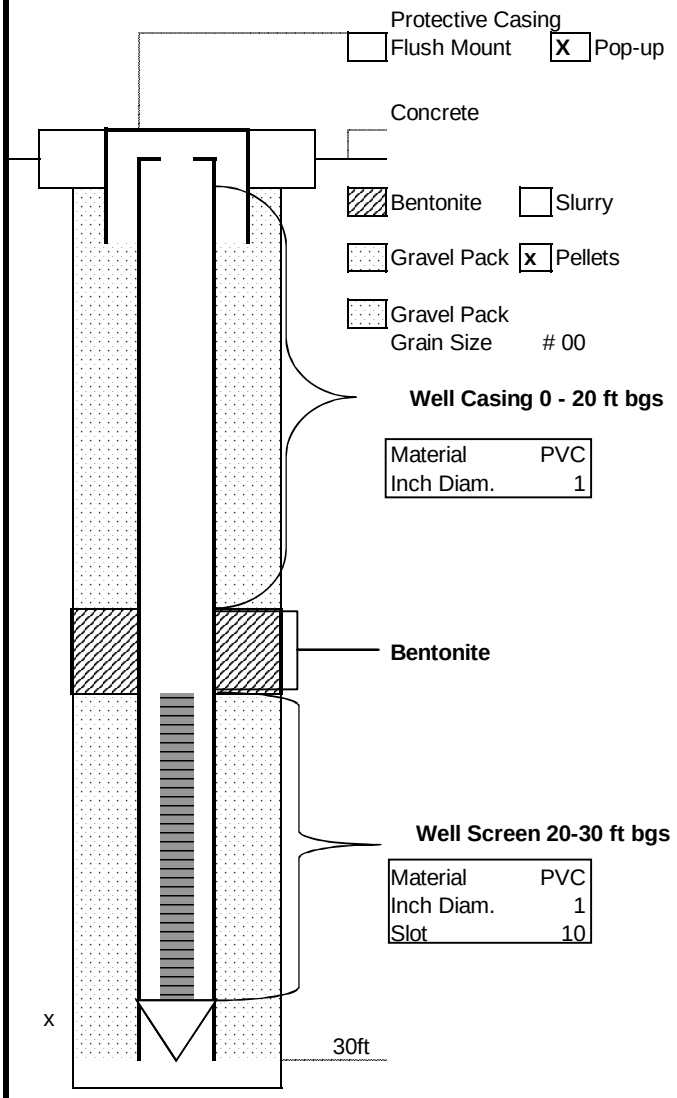
Monitoring Well No.:	MW10
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	5.29' Date: 12/2/2015
Installation Depth:	15ft bg
Survey Point Elevation:	
Installation Date:	11/20/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW11D



Note: Drawing is not to scale.
Depths are given in feet below land surface.

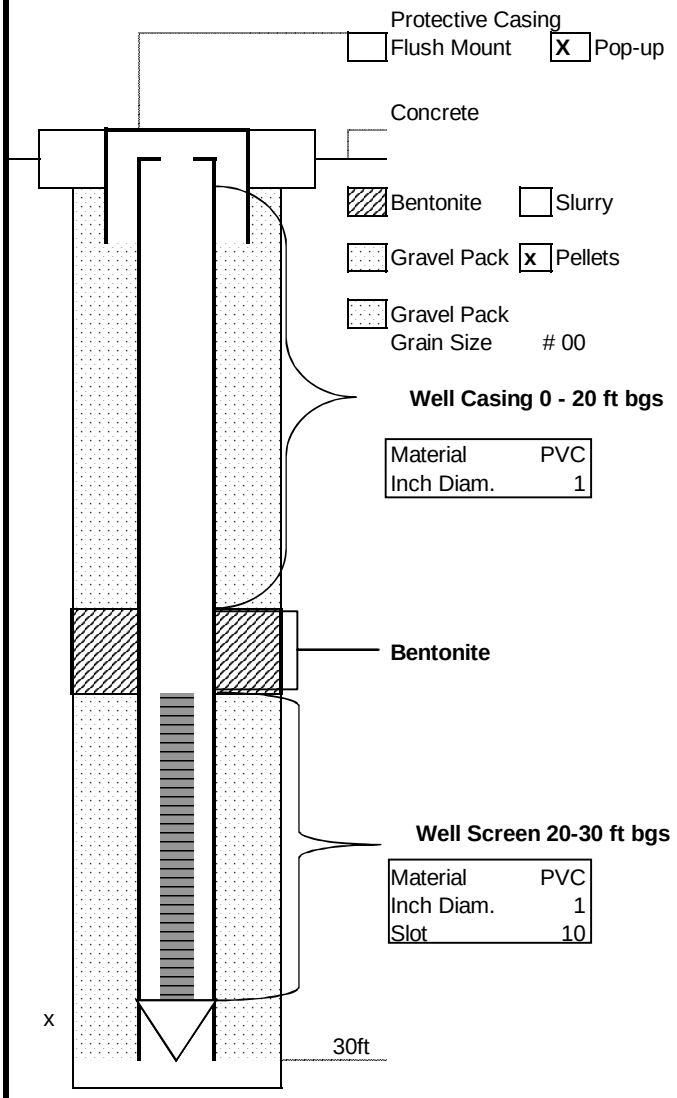
Monitoring Well No.:	MW11D
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	6.23' Date: 12/2/2015
Installation Depth:	30ft bg
Survey Point Elevation:	
Installation Date:	11/24/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW12D



Note: Drawing is not to scale.
Depths are given in feet below land surface.

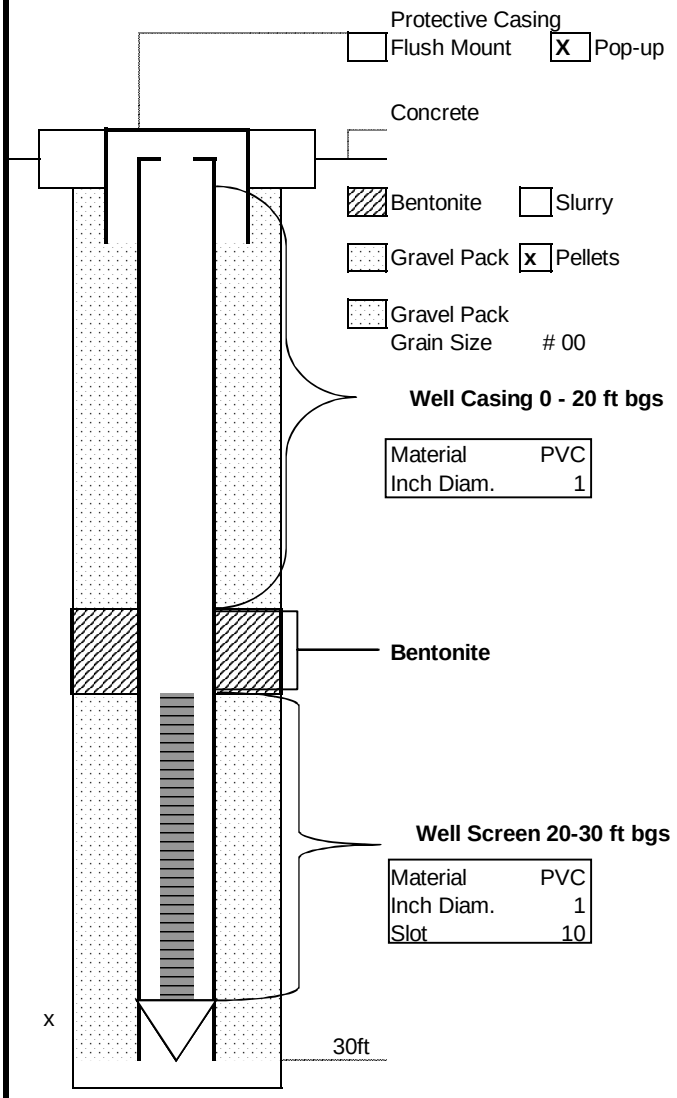
Monitoring Well No.:	MW12D
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	6.20' Date: 12/2/2015
Installation Depth:	30ft bg
Survey Point Elevation:	
Installation Date:	11/24/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

MW13D



Note: Drawing is not to scale.
Depths are given in feet below land surface.

Monitoring Well No.:	MW13D
Project:	2401 Third Avenue, Bronx NY
Depth to Groundwater:	5.89' Date: 12/2/2015
Installation Depth:	30ft bg
Survey Point Elevation:	
Installation Date:	11/24/2015
Drilling Contractor:	C2 Environmental Corp
Installation Method:	Hollow Geoprobe Rods
Water Removed During Development:	
Hydrogeologist:	Thomas Gallo
Company Name:	EBC

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WELL CONSTRUCTION LOG

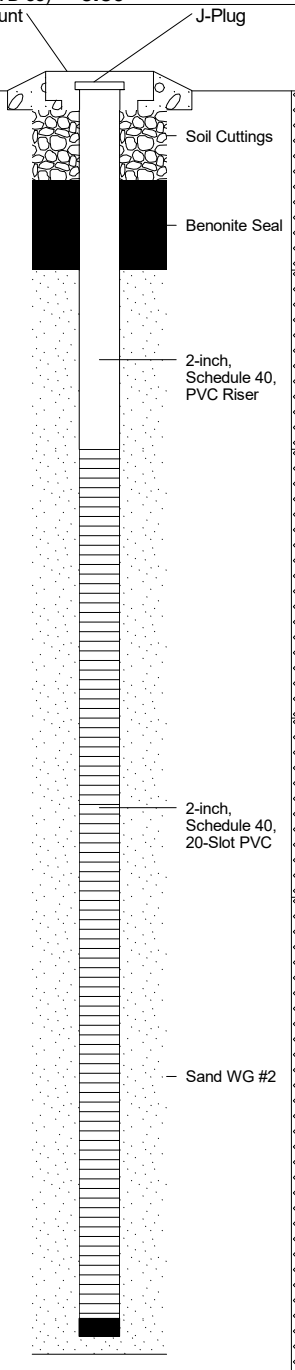
WELL NO.	NORTHING	EASTING
MW-1	**234026.89**	**1003134.19**

PROJECT NO./NAME	LOCATION
3171.0001Y000 / Former Mugler Shoring, Inc.	**2401 Third Ave**
APPROVED BY: **L. Dolginko** / LOGGED BY: **M. Todaro**	**Bronx, New York**
DRILLING CONTRACTOR/DRILLER: **Trinity Environmental / J. Sakellis**	GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/11/19-1/11/19**

CASING MAT./DIA.: **PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**

ELEVATION OF: (Feet ABOVE NAVD 88)	GROUND SURFACE	TOP OF WELL CASING	TOP & BOTTOM SCREEN	GRAVEL PACK SIZES
	5.80	**5.80**	**1.8 / -8.2**	**Morie #2**



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, medium to coarse SAND, some Silt and Gravel, little Clay; moist.			
		Brown, fine to medium SAND, some Clay and Silt, little Gravel; moist.	G	0.0	
				0.0	
		Brown, fine to medium SAND, some Clay and Silt, trace gravel; moist.			Hand cleared to 5' bls.
5				0.0	5
				0.0	
		Brown, medium to coarse SAND, some Silt, trace gravel; wet.			Water table encountered at 7' bls.
				0.0	
		Light brown, medium to coarse SAND, some Silt and fine Sand, trace gravel; wet.			
10					10
				0.0	
				0.0	
				0.0	
				0.0	End of boring 15' bls.
15					15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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WELL CONSTRUCTION LOG

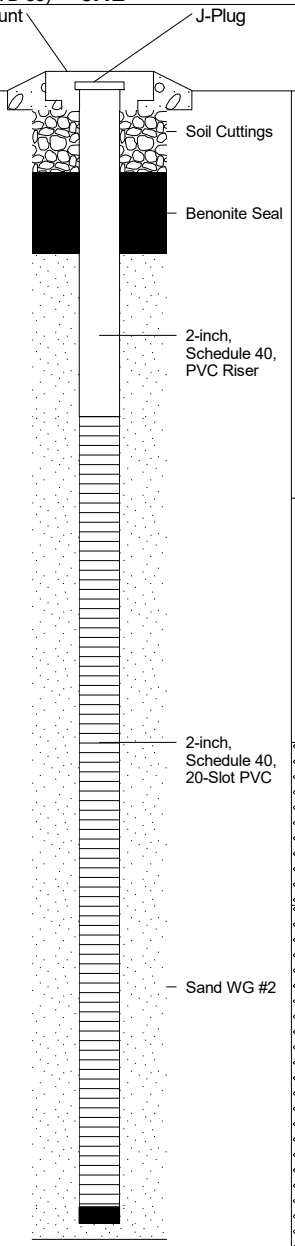
WELL NO.	NORTHING	EASTING
MW-2	**233821.86**	**1003055.93**

PROJECT NO./NAME	LOCATION
3171.0001Y000 / Former Mugler Shoring, Inc.	**2401 Third Ave**
APPROVED BY: **L. Dolginko** / LOGGED BY: **M. Todaro**	**Bronx, New York**
DRILLING CONTRACTOR/DRILLER: **Trinity Environmental / J. Sakellis**	GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/15/19-1/15/19**

CASING MAT./DIA.: **PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**

ELEVATION OF: (Feet ABOVE NAVD 88)	GROUND SURFACE	TOP OF WELL CASING	TOP & BOTTOM SCREEN	GRAVEL PACK SIZES
	5.12	**5.12**	**1.1 / -8.9**	**Morie #2**



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, medium to coarse SAND, some Gravel, Asphalt, and Concrete (FILL); moist.			
5		Brown, medium to coarse SAND, some Gravel and Brick, little Silt (FILL); moist.			Hand cleared to 5' bls.
					Water table encountered at 7' bls. Sample MW-2_7-9 collected for Part 375 VOCs and PAHs.
10		Dark grey, medium to coarse SAND, some Silt and Clay, little Gravel; wet.			Odor and staining observed from 8'-16.5' bls.
		Darky grey, medium to coarse SAND, some Clay, Silt, and Gravel; wet.			
15					Sample MW-2_13-15 collected for Part 375 VOCs and PAHs.
					Refusal at 16.5' bls. End of boring at 16.5' bls.

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WELL CONSTRUCTION LOG

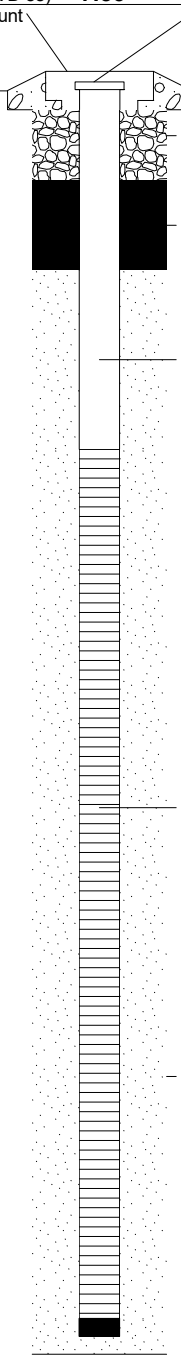
WELL NO.	NORTHING	EASTING
MW-3	**233719.87**	**1003186.4**

PROJECT NO./NAME	LOCATION
3171.0001Y000 / Former Mugler Shoring, Inc.	**2401 Third Ave**
APPROVED BY: **L. Dolginko** / LOGGED BY: **M. Todaro**	**Bronx, New York**
DRILLING CONTRACTOR/DRILLER: **Trinity Environmental / J. Sakellis**	GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/16/19-1/16/19**

CASING MAT./DIA.: **PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**

ELEVATION OF: (Feet ABOVE NAVD 88)	GROUND SURFACE	TOP OF WELL CASING	TOP & BOTTOM SCREEN	GRAVEL PACK SIZES
	7.56	**7.56**	**3.6 / -6.4**	**Morie #2**



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		CONCRETE and ASPHALT.			
		Brown, medium to coarse SAND, some Gravel, asphalt, concrete, and brick, little Silt (FILL); moist.		0.0	
		Brown to red, medium to coarse SAND and BRICK, some Gravel and Silt (FILL); moist.		0.0	
5				0.0	Hand cleared to 5' bls. 5
		Grey to brown, medium to coarse SAND, some fine Sand, little Silt, trace clay; wet.		0.0	Water table encountered at 7' bls.
		Grey, CLAY, little fine Sand; wet.		0.0	
10				0.0	10
		Brown, medium to coarse SAND, some Gravel, little Silt, trace clay; wet.		0.0	
15					End of boring at 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-1	**233891.55**	**1003131.25**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/10/19-1/10/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.72(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium, SAND, some Silt, Brick, Asphalt, and Concrete, little Clay (FILL); moist.		0.1	
		Brown, fine to medium, SAND, some Clay and Silt, little Brick (FILL); moist.		0.1	
5		Brown, fine to medium, SAND, some Clay and Silt, little Brick (FILL); wet.		0.1	Hand cleared to 5' bls. Sample RXSB-1_5-7 collected for Part 375 VOCs and PAHs.
				0.1	
		Tan, medium to coarse SAND, some Gravel; wet.			Water table encountered at 7' bls.
10				0.1	
		Brown, medium to coarse SAND, some Gravel and Silt, little Brick (FILL); wet.		0.1	
15				0.1	End of boring 15' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-10	**233816.1**	**1003071.4**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/8/19-1/8/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
5.92(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Dark brown, medium to coarse SAND, some Gravel, some Asphalt, Wood, Brick, and Concrete (FILL); moist.			
1				0.0	
2			G		
3					
		Dark brown, medium to coarse SAND, some Gravel, little Silt, Brick, Asphalt, Wood and Concrete (FILL); wet.		0.0	
4					
5					Hand cleared to 5' bls.
					Sample RXSB-10_5-7 collected for Part 375 VOCs and PAHs.
6					
7					
		Dark grey, medium to coarse SAND, some Gravel and Clay; wet.		0.0	Water table encountered at 7' bls.
8					
		Grey, CLAY; wet.			
9				0.0	
10					End of boring 10' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-11	**233809.05**	**1003069.98**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/8/19-1/8/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
5.52(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Dark brown, medium to coarse SAND, some Asphalt, Wood, Brick, and Concrete, little Gravel (FILL); moist.			
2		Dark brown, medium to coarse SAND, some Brick, little Gravel, Asphalt, Wood, and Concrete, trace silt (FILL); moist.	G	0.1	
3		Dark brown, medium to coarse SAND, some Gravel, little Silt, Brick, Asphalt, Wood, and Concrete (FILL); moist.			
5		Brown, medium to coarse SAND, some Gravel and Silt; wet.		0.7	Hand cleared to 5' bls. Sample RXSB-11_5-7 collected for Part 375 VOCs and PAHs.
7		Grey, CLAY; wet.		0.0	Water table encountered at 7' bls.
9				0.0	End of boring 10' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-12	**233805.12**	**1003079.25**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/7/19-1/7/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
5.69(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
1		Dark brown, medium to coarse SAND, some Silt, little Gravel, Wood, Concrete, Brick and Asphalt (FILL); moist.		2.3	
2					
3				0.8	
4					
5					Hand cleared to 5' bls.
		Dark brown, medium to coarse SAND, some Silt, little Gravel, Wood, Concrete, Brick and Asphalt (FILL); wet.		0.3	Sample RXSB-12_5-7 collected for Part 375 VOCs and PAHs.
6				0.2	
7		Dark grey, COBBLE and BOULDER; wet.			Water table encountered at 7' bls.
8				0.3	
9		Grey, CLAY; wet.			
10				0.7	
11					End of boring 11' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-13	**233880.8**	**1003120.45**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/11/19-1/11/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.56(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, some Silt, little Clay and Brick (FILL); moist.		0.0	
				0.0	
		Brown, fine to medium SAND, some Silt and Clay, trace brick (FILL); moist.			
5					Hand cleared to 5' bls. 5
		Brown, Silt; wet.		0.1	Sample RXSB-13_5-7 collected for Part 375 VOCs and PAHs.
				0.0	
		Brown, medium to coarse SAND, some Gravel and Silt, little Clay; wet.			Water table encountered at 7' bls.
				0.0	
10					10
		Tan, medium to coarse SAND; wet.		0.0	
				0.0	
15					End of boring 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-2	**233892.81**	**1003123.08**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/11/19-1/11/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.36(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, some Silt, Brick, and Asphalt (FILL); moist.		0.0	
				0.0	
		Brown, fine to medium SAND, some Silt, Clay, Brick, and Asphalt (FILL); moist.		0.0	
5					Hand cleared to 5' bls. 5
		Light brown, medium to coarse SAND, some Gravel, little Brick (FILL); wet.		0.0	Sample RXSB-2_5-7 collected for Part 375 VOCs and PAHs.
					Water table encountered at 7' bls.
10				0.0	10
		Tan, medium to coarse SAND, some Gravel; wet.		0.0	
				0.0	
15					End of boring 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-3	**233886.54**	**1003125.04**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/10/19-1/10/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.62(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, some Silt, Brick, Asphalt, and Concrete (FILL); moist.		0.0	
		Brown, fine to medium SAND, some Clay and Silt, little Brick (FILL); wet.		0.0	
5					Hand cleared to 5' bls. 5
					Sample RXSB-3_5-7 collected for Part 375 VOCs and PAHs.
					Water table encountered at 7' bls.
		Brown, medium to coarse SAND, some Silt and Gravel, little Clay, trace brick (FILL); wet.		0.0	
10				0.0	10
		Tan, medium to coarse SAND, some Gravel; wet.		0.0	
15					End of boring 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-4	**233866.31**	**1003121.95**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/9/19-1/9/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
7.19(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, some Gravel, little Silt; moist.		0.1	
		Brown, medium to coarse SAND, some Gravel, little Clay and Silt; moist.			Hand cleared to 5' bls.
5		Tan, medium to coarse SAND, some Silt, little Clay; wet.		0.2	5
				0.5	Water table encountered at 7' bls. Sample RXSB-4_7-9 collected for Part 375 VOCs and PAHs.
		Grey, CLAY, some fine Sand; wet.			
		Grey, CLAY, some fine Sand and Organics (grass); wet.		0.0	Odor and staining observed from 8' - 10' bls.
10		Tan, medium to coarse SAND, some Silt, little Clay; wet.			10
					Odor observed.
				0.2	
		Tan, medium to coarse SAND, some Silt, little Clay and Gravel; wet.			
				0.2	End of boring 15' bls.
15					15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-4-N	**233874.36**	**1003117.87**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/15/19-1/15/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.44(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, medium to coarse SAND, some Gravel, Brick, Concrete, and Asphalt, little Silt (FILL); moist.		0.0	
		Brown, medium to coarse SAND, some Gravel, little Clay, Brick, and Asphalt (FILL); wet.		0.0	
5				0.0	Hand cleared to 5' bls. 5
		Grey, medium to coarse SAND, some Clay, little Gravel and Organics; wet.		0.0	Water table encountered at 7' bls.
				0.0	
		Brown, medium to coarse SAND, some Clay, little Gravel and Organics; wet.		0.0	
10					10
		Tan, medium to coarse SAND, some Gravel; wet.		0.0	
				0.0	
15					End of boring 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-4-S	**233856.13**	**1003130.92**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/14/19-1/14/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
7.35(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, some Gravel, little Silt, Asphalt, Concrete, Brick, and Wood (FILL); moist.		0.0	
				0.0	
		Brown, fine to medium SAND, some Gravel, little Clay and Brick (FILL); moist.		0.0	
5					Hand cleared to 5' bls. 5
		Brown, fine to medium SAND, little Silt and Clay, trace gravel; wet.		0.0	
		Brown, CLAY and fine to medium SAND, little Silt; wet.		0.0	Water table encountered at 7' bls.
		Grey, fine to medium SAND, some Clay and Silt; wet.		0.0	
10					10
				0.0	
		Tan, medium to coarse SAND, some Gravel; wet.		0.0	
				0.0	
15					End of boring 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-5	**233874.15**	**1003112.42**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/10/19-1/10/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.77(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, medium to coarse SAND, some Gravel and Silt, little Clay, little Brick, Wood and Concrete (FILL); moist.		0.0	
			G	0.0	
5					Hand cleared to 5' bls. 5
		Brown, medium to coarse SAND, some Gravel and Silt, little Clay, little Brick, Wood and Concrete (FILL); wet.		0.0	
				6.2	
		Dark grey, medium to coarse SAND, some Gravel and Clay, little Silt and Brick (FILL); wet.		6.3	Sample RXSB-5_7-9 collected for Part 375 VOCs and PAHs. Water table encountered at 7' bls. Odor and staining observed.
				31.3	
10		Grey, medium to coarse SAND, some Gravel; wet.			10
				0.9	
				6.2	
		Tan, medium to coarse SAND, some Gravel; wet.			
					End of boring 15' bls.
15				2.1	15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-5-N	**233878.13**	**1003109.52**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/14/19-1/14/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.85(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, some Gravel, Silt, Brick, Asphalt, and Concrete (FILL); moist.		0.0	
				0.0	
5					5
				0.0	
				0.3	Water table encountered at 7' bls.
		Brown, fine to medium SAND, some Gravel, little Clay and Silt, trace brick (FILL); wet			
10					10
				0.4	
		Tan, medium to coarse SAND, some Gravel; wet.		0.0	
				0.0	
15					End of boring 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING
RXSB-6	**233860.85**	**1003115.8**

PROJECT NO./NAME	LOCATION
3171.0001Y000 / Former Mugler Shoring, Inc.	**2401 Third Ave**
APPROVED BY: **L. Dolginko** / LOGGED BY: **M. Todaro**	**Bronx, New York**
DRILLING CONTRACTOR/DRILLER: **Trinity Environmental / J. Sakellis**	GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/9/19-1/9/19**

LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL
6.69(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, medium to coarse SAND, some Gravel, little Silt; moist.		0.1	
		Brown, medium SAND, some Gravel, little Brick, Asphalt and Concrete (FILL); moist.		0.1	
		Brown, fine to medium SAND, some Silt and Clay, little Gravel; moist.		0.1	
5		Brown, fine to medium SAND, some Silt and Clay, little Gravel; wet.		0.4	Hand cleared to 5' bls. Sample RXSB-6_7-9 collected for Part 375 VOCs and PAHs.
		Grey, fine to medium SAND, some Clay, Silt and Plant debris, trace gravel; wet.		12.5	Water table encountered at 7' bls. Odor and staining observed.
		Grey, fine to medium SAND, some Clay and Silt, little Gravel; wet.		2.4	
10		Grey, fine to medium SAND, some Clay and Silt, little Gravel; wet.		0.9	
		Tan, medium to coarse SAND, little Gravel and Silt; wet.		4.5	
				0.3	
15					End of boring 15' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-6-W	**233863.01**	**1003102.05**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/15/19-1/15/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.82(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, medium to coarse SAND, some Gravel, Aspahlt, Brick, Concrete and Wood, little Silt, trace clay (FILL); moist.		0.0	
		Brown, medium to coarse SAND, little Gravel, Clay, Silt and Brick (FILL); moist.		0.0	
				0.2	Hand cleared to 5' bls.
5		Brown, medium to coarse SAND, some Gravel, little Clay, trace brick (FILL); moist.		0.0	5
		Brown, medium to coarse SAND, some Gravel, little Clay, trace brick (FILL); wet.		0.2	Water table encountered at 7' bls.
		Grey, find to medium SAND, some Clay, little Gravel and oragnic material; wet.		0.0	
10		Grey, medium to coarse SAND, some Gravel and Clay; wet.		0.0	10
		Grey, fine to medium SAND, some Clay, little Gravel; wet.		0.0	
		Tan, medium to coarse SAND, some Gravel; wet.		0.0	
15					End of boring 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-7	**233860.06**	**1003122.23**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/8/19-1/8/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
7.05(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, some Gravel, little Brick, and Asphalt (FILL); moist.			
		Tan, medium to coarse SAND, some Gravel, trace brick (FILL); moist.		0.6	
		Brown, medium to coarse SAND, some Gravel, Brick, and Asphalt (FILL); moist.	G	0.4	
		Grey, CLAY and fine SAND; moist.			Hand cleared to 5' bls.
5		Dark brown, medium to coarse SAND, some Gravel, little Brick (FILL); wet.		0.2	Sample RXSB-7_7-9 collected for Part 375 VOCs and PAHs. 5
		Dark brown, medium to coarse SAND, some Gravel, little Brick (FILL); wet.		0.8	
		Grey, CLAY, little fine Sand; wet.		0.9	
				35	Water table encountered at 7' bls. Odor and staining observed from 7-14' bls.
10		Dark grey, medium to coarse SAND, some Silt, little Clay; wet.			10
				50.9	
		Light grey, medium SAND, some Silt, trace clay; wet.			
		Tan, medium to coarse SAND, little Gravel and Silt; wet.		13.5	
15				3.7	End of boring 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-7-W	**233850.28**	**1003124.12**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/14/19-1/14/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.79(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, some Gravel, Asphalt, Concrete, Brick, and Wood, little Silt (FILL); moist.		0.0	
		Brown, fine to medium SAND, little Silt, Clay, and Brick, trace gravel (FILL); moist.		0.0	
				0.0	
5					Hand cleared to 5' bls. 5
		Brown, fine to medium SAND, some Clay, Silt and Brick (FILL); wet.			
					Water table encountered at 7' bls.
				0.0	
10					10
				0.2	
		Tan, medium to coarse SAND, some Gravel; wet.		0.0	
				0.0	
15					End of boring 15' bls. 15

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-8	**233826.05**	**1003157.03**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/15/19-1/15/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
7.75(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, medium to coarse SAND, some Concrete, Brick, Asphalt, and Wood (FILL); moist.		0.0	
				0.0	Hand cleared to 5' bls.
5					5
					Sample RXSB-8_5-7 collected for Part 375 VOCs and PAHs.
				0.0	Water table encountered at 7' bls.
		Brown to grey, medium to coarse SAND, some Gravel and Clay, trace brick (FILL); wet.		0.3	
10					10
				0.1	
15					End of boring 15' bls. 15

G

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING
RXSB-8	**233826.05**	**1003157.03**

PROJECT NO./NAME	LOCATION
3171.0001Y000 / Former Mugler Shoring, Inc.	**2401 Third Ave**
APPROVED BY: **L. Dolginko** / LOGGED BY: **M. Todaro**	**Bronx, New York**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
				0.0	

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
RXSB-9	**233814.96**	**1003079.36**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/14/19-1/14/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.00(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
1		Dark Brown, medium to coarse SAND, some Asphalt, Wood, Brick, Concrete, little Gravel, (FILL); moist.		0.0	
2					
3		Brown, medium to coarse SAND, some Brick and Gravel, little Silt, trace asphalt, brick and concrete (FILL); wet.	G	0.0	
4					
5		Brown, medium to coarse SAND, some Gravel, little Silt, trace asphalt, brick and concrete (FILL); wet.		0.0	Hand cleared to 5' bls.
6				0.0	Sample RXSB-9_5-7 collected for Part 375 VOCs and PAHs.
7				0.0	
8				0.0	Water table encountered at 7' bls.
9		Grey, CLAY; wet.			
10					End of boring 10' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
UST-1	**233888.67**	**1003128.42**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/10/19-1/10/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.87(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Brown, fine to medium SAND, some Silt, Brick, Asphalt, and Concrete (FILL); moist.			
1				0.1	
2					
3		Brown, fine to medium SAND, some Clay and Silt, little Brick (FILL); moist.		0.2	
4					End of boring 5' bls.
5				0.4	Hand cleared to 5' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
UST-2	**233863.64**	**1003118.8**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/8/19-1/8/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
7.09(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"		PID Values (ppm)	REMARKS
1		Brown, medium to coarse SAND, some Silt, little Clay, trace gravel; moist.			0.3	
2				G		
3					0.2	
4		Brown, medium to coarse SAND, some Clay, little Silt; moist.				
5					0.1	End of boring 5' bls. Hand cleared to 5' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
UST-3	**233758.88**	**1003131.36**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/7/19-1/7/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.19(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
1		Brown, medium to coarse SAND, little Gravel, Wood, Brick, and Concrete (FILL); moist.		0.9	
2		Red, BRICK (FILL); moist.			
3		Brown, medium to coarse SAND, some Gravel, trace brick (FILL); moist.	G	0.4	
4		Dark brown, COBBLE and BOULDER; moist.		0.4	
5				0.3	End of boring 5' bls. Hand cleared to 5' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
UST-4	**233812.08**	**1003073.96**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/7/19-1/7/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
5.82(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
1		Dark brown, medium to coarse SAND, some Silt, little Gravel and Wood, trace concrete and brick (FILL); moist.		0.1	
2					
3				0.2	
4		Dark brown, medium to coarse SAND, some Silt, little Gravel and Wood, trace concrete and brick (FILL); wet.		0.7	Water table encountered at 4' bls.
5				1.4	End of boring 5' bls. Hand cleared to 5' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
UST-5	**233864.2**	**1003066.38**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/7/19-1/7/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
6.75(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"		PID Values (ppm)	REMARKS
1		Brown, medium to coarse SAND, some Silt, Gravel, little Wood, Brick, and Concrete (FILL); moist.			0.7	
2		Brown, medium to coarse SAND, some Gravel, trace brick (FILL); moist.		G		
3					0.6	
4		Brown, medium to coarse SAND, some Gravel, trace brick (FILL); wet.				
5					0.1	End of boring at 5' bls. Hand cleared to 5' bls.

BORING/FEET 3171.0001Y000.GPJ ROUX.GDT 2/4/19

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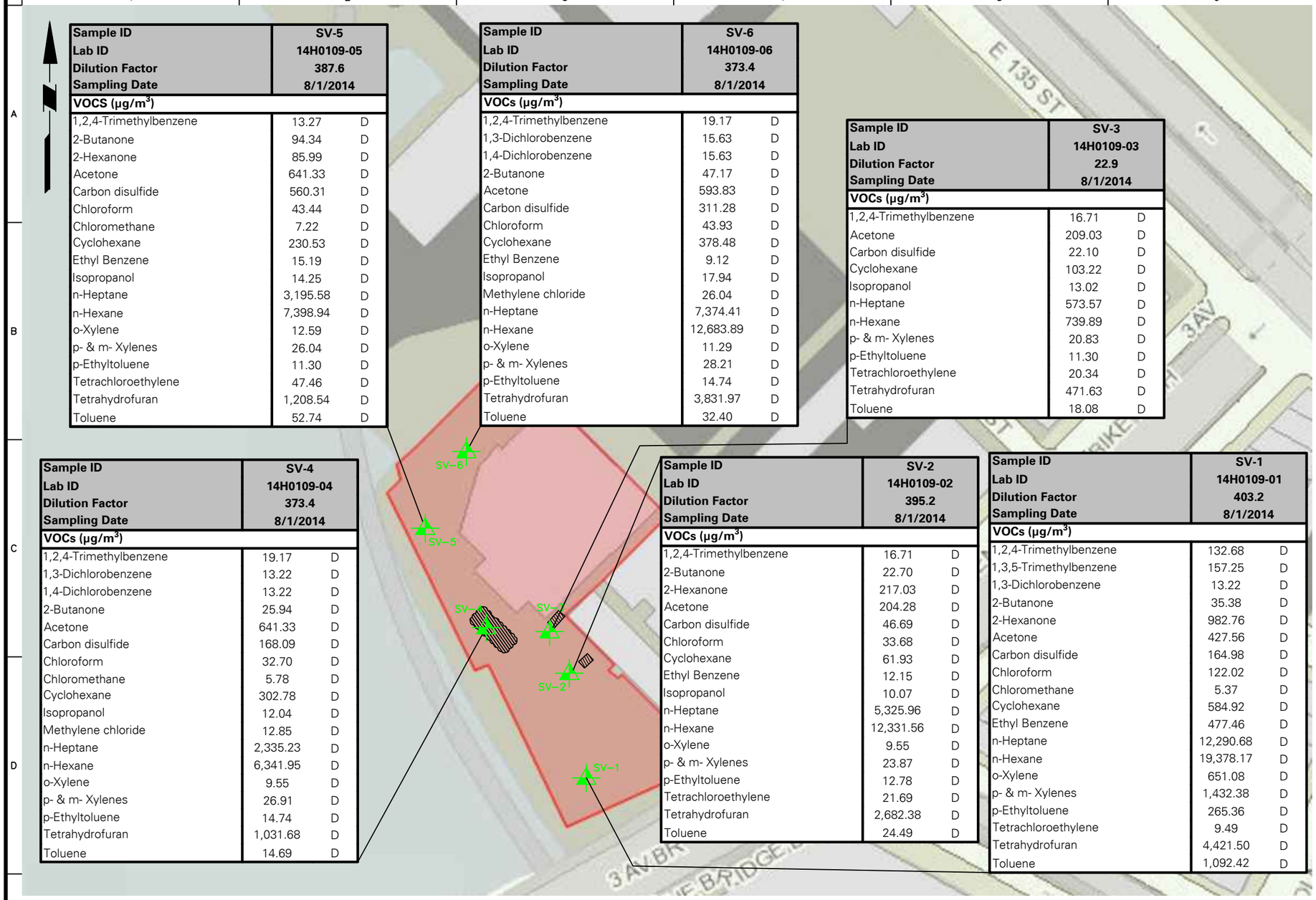
SOIL BORING LOG

WELL NO.	NORTHING	EASTING		
WC-3	**233757.76**	**1003167.32**		
PROJECT NO./NAME		LOCATION		
3171.0001Y000 / Former Mugler Shoring, Inc.		**2401 Third Ave**		
APPROVED BY	LOGGED BY	**Bronx, New York**		
L. Dolginko	**M. Todaro**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / J. Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro Core**	**1/16/19-1/16/19**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
7.27(FT. ABOVE NAVD 88)	**Not Measured**	**Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
1		CONCRETE and ASPHALT.			
2		Brown, medium to fine SAND, some Gravel, Brick, Asphalt, and Concrete, little Silt (FILL); moist.		0.0	
3			G		
4		Dark brown, medium to coarse SAND, some Gravel, little Brick, Silt, and Clay; wet.		0.0	
5				0.0	Composite sample WC-3_0-9 collected for Cyanide Reactive 9014, Sulfide Reactive 9034, Ignitability 1030, Hex/Tri Chrom 7196A, Total Cyanide 9012B, TCL/TCLP Pest 8081B, PCBs 8082A, TAL /TCLP Metals 6010D, TCLP Mercury 7470A, TCLP Herb 8151A, and pH. Hand cleared to 5' bls.
6				0.0	
7				43.5	Grab sample WC-9_7-8 collected for VOCs, TCLP VOCs, EPH, and Paint Filter.
8				4.4	Water table encountered at 8' bls.
9					
10				0.0	End of boring 10' bls.

APPENDIX D

Phase II ESA and RI Soil Vapor Data



Sample ID	SV-5	
Lab ID	14H0109-05	
Dilution Factor	387.6	
Sampling Date	8/1/2014	
VOCS (µg/m³)		
1,2,4-Trimethylbenzene	13.27	D
2-Butanone	94.34	D
2-Hexanone	85.99	D
Acetone	641.33	D
Carbon disulfide	560.31	D
Chloroform	43.44	D
Chloromethane	7.22	D
Cyclohexane	230.53	D
Ethyl Benzene	15.19	D
Isopropanol	14.25	D
n-Heptane	3,195.58	D
n-Hexane	7,398.94	D
o-Xylene	12.59	D
p- & m- Xylenes	26.04	D
p-Ethyltoluene	11.30	D
Tetrachloroethylene	47.46	D
Tetrahydrofuran	1,208.54	D
Toluene	52.74	D

Sample ID	SV-6	
Lab ID	14H0109-06	
Dilution Factor	373.4	
Sampling Date	8/1/2014	
VOCs (µg/m³)		
1,2,4-Trimethylbenzene	19.17	D
1,3-Dichlorobenzene	15.63	D
1,4-Dichlorobenzene	15.63	D
2-Butanone	47.17	D
Acetone	593.83	D
Carbon disulfide	311.28	D
Chloroform	43.93	D
Cyclohexane	378.48	D
Ethyl Benzene	9.12	D
Isopropanol	17.94	D
Methylene chloride	26.04	D
n-Heptane	7,374.41	D
n-Hexane	12,683.89	D
o-Xylene	11.29	D
p- & m- Xylenes	28.21	D
p-Ethyltoluene	14.74	D
Tetrahydrofuran	3,831.97	D
Toluene	32.40	D

Sample ID	SV-3	
Lab ID	14H0109-03	
Dilution Factor	22.9	
Sampling Date	8/1/2014	
VOCs (µg/m³)		
1,2,4-Trimethylbenzene	16.71	D
Acetone	209.03	D
Carbon disulfide	22.10	D
Cyclohexane	103.22	D
Isopropanol	13.02	D
n-Heptane	573.57	D
n-Hexane	739.89	D
p- & m- Xylenes	20.83	D
p-Ethyltoluene	11.30	D
Tetrachloroethylene	20.34	D
Tetrahydrofuran	471.63	D
Toluene	18.08	D

Sample ID	SV-4	
Lab ID	14H0109-04	
Dilution Factor	373.4	
Sampling Date	8/1/2014	
VOCs (µg/m³)		
1,2,4-Trimethylbenzene	19.17	D
1,3-Dichlorobenzene	13.22	D
1,4-Dichlorobenzene	13.22	D
2-Butanone	25.94	D
Acetone	641.33	D
Carbon disulfide	168.09	D
Chloroform	32.70	D
Chloromethane	5.78	D
Cyclohexane	302.78	D
Isopropanol	12.04	D
Methylene chloride	12.85	D
n-Heptane	2,335.23	D
n-Hexane	6,341.95	D
o-Xylene	9.55	D
p- & m- Xylenes	26.91	D
p-Ethyltoluene	14.74	D
Tetrahydrofuran	1,031.68	D
Toluene	14.69	D

Sample ID	SV-2	
Lab ID	14H0109-02	
Dilution Factor	395.2	
Sampling Date	8/1/2014	
VOCs (µg/m³)		
1,2,4-Trimethylbenzene	16.71	D
2-Butanone	22.70	D
2-Hexanone	217.03	D
Acetone	204.28	D
Carbon disulfide	46.69	D
Chloroform	33.68	D
Cyclohexane	61.93	D
Ethyl Benzene	12.15	D
Isopropanol	10.07	D
n-Heptane	5,325.96	D
n-Hexane	12,331.56	D
o-Xylene	9.55	D
p- & m- Xylenes	23.87	D
p-Ethyltoluene	12.78	D
Tetrachloroethylene	21.69	D
Tetrahydrofuran	2,682.38	D
Toluene	24.49	D

Sample ID	SV-1	
Lab ID	14H0109-01	
Dilution Factor	403.2	
Sampling Date	8/1/2014	
VOCs (µg/m³)		
1,2,4-Trimethylbenzene	132.68	D
1,3,5-Trimethylbenzene	157.25	D
1,3-Dichlorobenzene	13.22	D
2-Butanone	35.38	D
2-Hexanone	982.76	D
Acetone	427.56	D
Carbon disulfide	164.98	D
Chloroform	122.02	D
Chloromethane	5.37	D
Cyclohexane	584.92	D
Ethyl Benzene	477.46	D
n-Heptane	12,290.68	D
n-Hexane	19,378.17	D
o-Xylene	651.08	D
p- & m- Xylenes	1,432.38	D
p-Ethyltoluene	265.36	D
Tetrachloroethylene	9.49	D
Tetrahydrofuran	4,421.50	D
Toluene	1,092.42	D

LEGEND:

- APPROXIMATE SITE BOUNDARY
- SV–6 SOIL VAPOR POINT LOCATION AND ID (LANGAN 2014)
- KNOWN AND UNKONWN UST LOCATIONS

NOTES:

1. SOIL VAPOR SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) AIR GUIDANCE VALUE (AGV) (TABLE 1).
2. ONLY DETECTIONS ARE SHOWN ON THE FIGURE.
3. NYSDOH AGV EXCEEDANCES ARE SHADED AND BOLDED.
4. UST - UNDERGROUND STORAGE TANK
5. VOC - VOLATILE ORGANIC COMPOUND
6. UG/M^3 - MICROGRAMS PER CUBIC METER
7. "~" - CRITERIA DOES NOT EXIST
8. D - RESULT IS FROM AN ANALYSIS THAT REQUIRED A DILUTION

TABLE 1

Sample ID / Lab ID / Dilution Factor / Sampling Date	NYSDOH AGV
VOCs (µg/m³)	
1,2,4-Trimethylbenzene	~
1,3,5-Trimethylbenzene	~
1,3-Dichlorobenzene	~
1,4-Dichlorobenzene	~
2-Butanone	~
2-Hexanone	~
Acetone	~
Carbon disulfide	~
Chloroform	~
Chloromethane	~
Cyclohexane	~
Ethyl Benzene	~
Isopropanol	~
Methylene chloride	60
n-Heptane	~
n-Hexane	~
o-Xylene	~
p- & m- Xylenes	~
p-Ethyltoluene	~
Tetrachloroethylene	60
Tetrahydrofuran	~
Toluene	~

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

100 0 50 100
SCALE IN FEET

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Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project
2401 THIRD AVENUE
BLOCK No. 2319, LOT No. 2
BRONX
BRONX COUNTY NEW YORK

Drawing Title
SOIL VAPOR ANALYTICAL RESULTS MAP

Project No.	Drawing No.
170305901	5
Date: 8/18/2014	
Scale: 1" = 100'	
Drawn By: HHG / Checked By: RJW	
Submission Date	

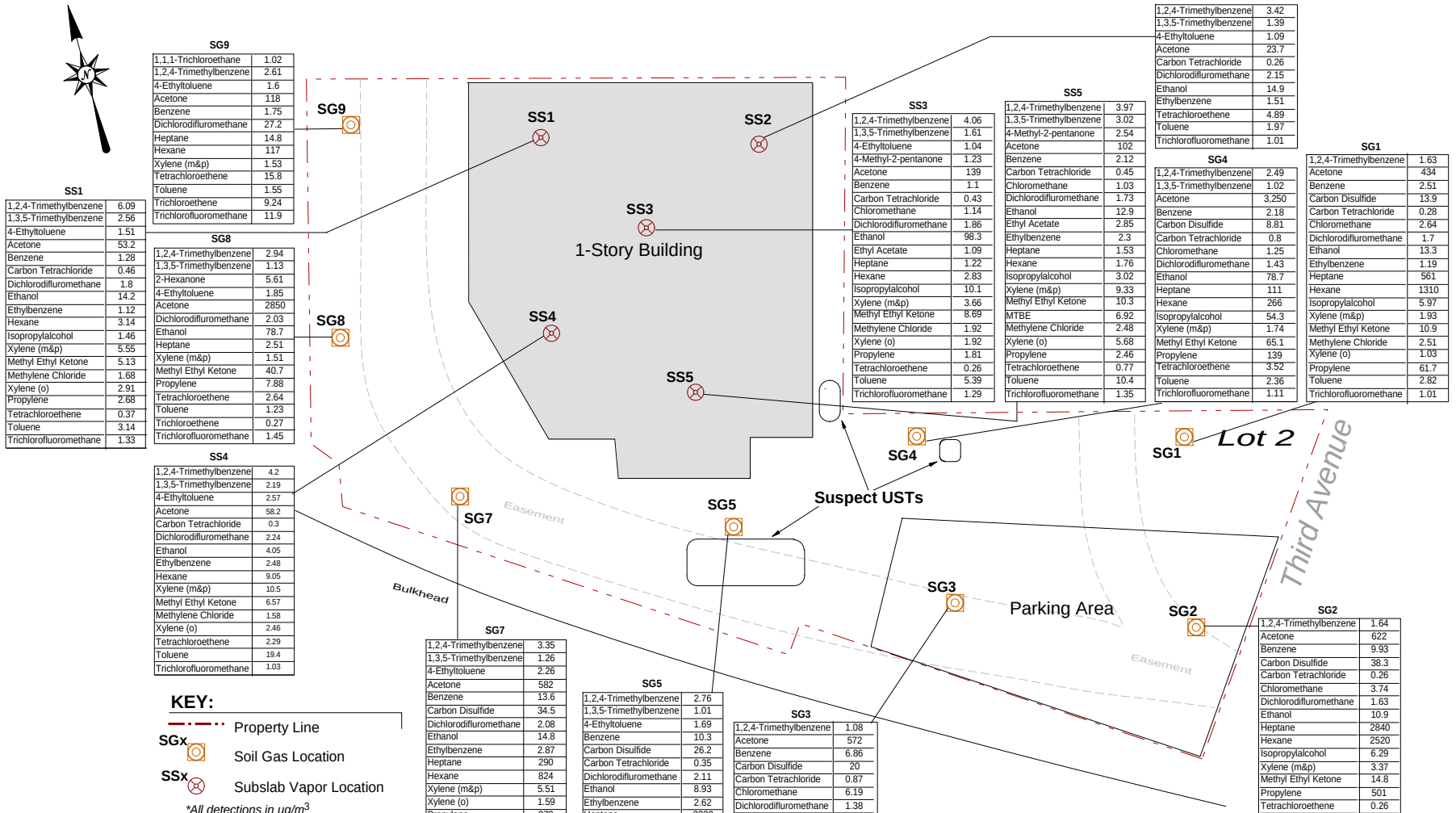
Filename: \\langan.com\data\NY\data9\170305901\Cadd Data - 170305901\2D-DesignFiles\Phase 2\Soil Vapor Analytical Results.dwg Date: 8/26/2014 Time: 10:56 User: sclout Style Table: Langan.stb Layout: ANSIB-BL

Table 3
Summary of Analytical Soil Vapor Data
Phase II Environmental Site Investigation

2401 Third Avenue
Bronx, New York
Langan Project No. 170305901

Sample ID Lab ID Dilution Factor Sampling Date	NYSDOH AGV	SV-1 14H0109-01 403.2 8/1/2014		SV-2 14H0109-02 395.2 8/1/2014		SV-3 14H0109-03 22.9 8/1/2014		SV-4 14H0109-04 373.4 8/1/2014		SV-5 14H0109-05 387.6 8/1/2014		SV-6 14H0109-06 373.4 8/1/2014	
Volatile Organic Compounds (µg/m³)													
1,1,1-Trichloroethane	~	10.91	U	10.91	U	12.54	U	10.36	U	10.36	U	10.36	U
1,1,2,2-Tetrachloroethane	~	13.72	U	13.72	U	15.78	U	13.04	U	13.04	U	13.04	U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	~	15.32	U	15.32	U	17.62	U	14.56	U	14.56	U	14.56	U
1,1,2-Trichloroethane	~	10.91	U	10.91	U	12.54	U	10.36	U	10.36	U	10.36	U
1,1-Dichloroethane	~	8.09	U	8.09	U	9.31	U	7.69	U	7.69	U	7.69	U
1,1-Dichloroethylene	~	7.93	U	7.93	U	9.12	U	7.53	U	7.53	U	7.53	U
1,2,4-Trichlorobenzene	~	14.84	U	14.84	U	17.06	U	14.09	U	14.09	U	14.09	U
1,2,4-Trimethylbenzene	~	132.68	D	16.71	D	16.71	D	19.17	D	13.27	D	19.17	D
1,2-Dibromoethane	~	15.36	U	15.36	U	17.67	U	14.59	U	14.59	U	14.59	U
1,2-Dichlorobenzene	~	12.02	U	12.02	U	13.82	U	11.42	U	11.42	U	11.42	U
1,2-Dichloroethane	~	8.09	U	8.09	U	9.31	U	7.69	U	7.69	U	7.69	U
1,2-Dichloropropane	~	9.24	U	9.24	U	10.62	U	8.78	U	8.78	U	8.78	U
1,2-Dichlorotetrafluoroethane	~	13.98	U	13.98	U	16.07	U	13.28	U	13.28	U	13.28	U
1,3,5-Trimethylbenzene	~	157.25	D	9.83	U	11.30	U	9.34	U	9.34	U	9.34	U
1,3-Butadiene	~	8.67	U	8.67	U	9.97	U	8.23	U	8.23	U	8.23	U
1,3-Dichlorobenzene	~	13.22	D	12.02	U	13.82	U	13.22	D	11.42	U	15.63	D
1,4-Dichlorobenzene	~	12.02	U	12.02	U	13.82	U	13.22	D	11.42	U	15.63	D
1,4-Dioxane	~	7.20	U	7.20	U	8.28	U	6.84	U	6.84	U	6.84	U
2-Butanone	~	35.38	D	22.70	D	6.78	U	25.94	D	94.34	D	47.17	D
2-Hexanone	~	982.76	D	217.03	D	18.84	U	15.15	U	85.99	D	15.15	U
4-Methyl-2-pentanone	~	8.19	U	8.19	U	9.42	U	7.78	U	7.78	U	7.78	U
Acetone	~	427.56	D	204.28	D	209.03	D	641.33	D	641.33	D	593.83	D
Benzene	~	6.39	U	6.39	U	7.34	U	6.07	U	6.07	U	6.07	U
Benzyl chloride	~	10.35	U	10.35	U	11.90	U	9.83	U	9.83	U	9.83	U
Bromodichloromethane	~	12.41	U	12.41	U	14.27	U	11.79	U	11.79	U	11.79	U
Bromoform	~	20.67	U	20.67	U	23.77	U	19.63	U	19.63	U	19.63	U
Bromomethane	~	7.76	U	7.76	U	8.93	U	7.37	U	7.37	U	7.37	U
Carbon disulfide	~	164.98	D	46.69	D	22.10	D	168.09	D	560.31	D	311.28	D
Carbon tetrachloride	~	3.14	U	3.08	U	3.58	U	2.96	U	3.02	U	2.96	U
Chlorobenzene	~	9.20	U	9.20	U	10.58	U	8.74	U	8.74	U	8.74	U
Chloroethane	~	5.28	U	5.28	U	6.07	U	5.01	U	5.01	U	5.01	U
Chloroform	~	122.02	D	33.68	D	11.23	U	32.70	D	43.44	D	43.93	D
Chloromethane	~	5.37	D	4.13	U	4.75	U	5.78	D	7.22	D	3.92	U
cis-1,2-Dichloroethylene	~	7.93	U	7.93	U	9.12	U	7.53	U	7.53	U	7.53	U
cis-1,3-Dichloropropylene	~	9.07	U	9.07	U	10.43	U	8.62	U	8.62	U	8.62	U
Cyclohexane	~	584.92	D	61.93	D	103.22	D	302.78	D	230.53	D	378.48	D
Dibromochloromethane	~	16.05	U	16.05	U	18.45	U	15.24	U	15.24	U	15.24	U
Dichlorodifluoromethane	~	9.89	U	9.89	U	11.37	U	9.39	U	9.39	U	9.39	U
Ethyl acetate	~	14.41	U	14.41	U	16.57	U	13.33	U	14.05	U	13.33	U
Ethyl Benzene	~	477.46	D	12.15	D	9.98	U	8.25	U	15.19	D	9.12	D
Hexachlorobutadiene	~	21.32	U	21.32	U	24.52	U	20.26	U	20.26	U	20.26	U
Isopropanol	~	9.83	U	10.07	D	13.02	D	12.04	D	14.25	D	17.94	D
Methyl Methacrylate	~	0	U	0	U	0	U	0	U	0	U	0	U
Methyl tert-butyl ether (MTBE)	~	7.20	U	7.20	U	8.27	U	6.84	U	6.84	U	6.84	U
Methylene chloride	60	13.89	U	13.89	U	15.97	U	12.85	D	13.54	U	26.04	D
n-Heptane	~	12,290.68	D	5,325.96	D	573.57	D	2,335.23	D	3,195.58	D	7,374.41	D
n-Hexane	~	19,378.17	D	12,331.56	D	739.89	D	6,341.95	D	7,398.94	D	12,683.89	D
o-Xylene	~	651.08	D	9.55	D	9.98	U	9.55	D	12.59	D	11.29	D
p- & m- Xylenes	~	1,432.38	D	23.87	D	20.83	D	26.91	D	26.04	D	28.21	D
p-Ethyltoluene	~	265.36	D	12.78	D	11.30	D	14.74	D	11.30	D	14.74	D
Propylene	~	3.44	U	3.44	U	3.96	U	3.27	U	3.27	U	3.27	U
Styrene	~	8.52	U	8.52	U	9.79	U	8.09	U	8.09	U	8.09	U
Tetrachloroethylene	100	9.49	D	21.69	D	20.34	D	3.19	U	47.46	D	3.19	U
Tetrahydrofuran	~	4,421.50	D	2,682.38	D	471.63	D	1,031.68	D	1,208.54	D	3,831.97	D
Toluene	~	1,092.42	D	24.49	D	18.08	D	14.69	D	52.74	D	32.40	D
trans-1,2-Dichloroethylene	~	7.93	U	7.93	U	9.12	U	7.53	U	7.53	U	7.53	U
trans-1,3-Dichloropropylene	~	9.07	U	9.07	U	10.43	U	8.62	U	8.62	U	8.62	U
Trichloroethylene	5	2.69	U	2.63	U	3.06	U	2.52	U	2.58	U	2.52	U
Trichlorofluoromethane (Freon 11)	~	11.23	U	11.23	U	12.92	U	10.67	U	10.67	U	10.67	U
Vinyl acetate	~	7.04	U	7.04	U	8.10	U	6.69	U	6.69	U	6.69	U
Vinyl Chloride	~	2.56	U	2.53	U	2.81	U	2.38	U	2.48	U	2.38	U

NOTES:
1. No New York State Department of Health (NYSDOH) Air Guideline Value (AGV) exceedances were reported.
2. µg/m3 : micrograms per cubic meter
U = analyte not detected at or above the level indicated
B = analyte found in the analysis batch blank
D = result is from an analysis that required a dilution
~ = no regulatory limit has been established for this analyte



SS1

1,2,4-Trimethylbenzene	6.09
1,3,5-Trimethylbenzene	2.56
4-Ethyltoluene	1.51
Acetone	53.2
Benzene	1.28
Carbon Tetrachloride	0.46
Dichlorodifluromethane	1.8
Ethanol	14.2
Ethylbenzene	1.12
Hexane	3.14
Isopropylalcohol	1.46
Xylene (m&p)	5.55
Methyl Ethyl Ketone	5.13
Methylene Chloride	1.68
Xylene (o)	2.91
Propylene	2.68
Tetrachloroethene	0.37
Toluene	3.14
Trichlorofluoromethane	1.33

SG9

1,1,1-Trichloroethane	1.02
1,2,4-Trimethylbenzene	2.61
4-Ethyltoluene	1.6
Acetone	118
Benzene	1.75
Dichlorodifluromethane	27.2
Heptane	14.8
Hexane	117
Xylene (m&p)	1.53
Tetrachloroethene	15.8
Toluene	1.55
Trichloroethene	9.24
Trichlorofluoromethane	11.9

SG8

1,2,4-Trimethylbenzene	2.94
1,3,5-Trimethylbenzene	1.13
2-Hexanone	5.61
4-Ethyltoluene	1.85
Acetone	2850
Dichlorodifluromethane	2.03
Ethanol	78.7
Heptane	2.51
Xylene (m&p)	1.51
Methyl Ethyl Ketone	40.7
Propylene	7.88
Tetrachloroethene	2.64
Toluene	1.23
Trichloroethene	0.27
Trichlorofluoromethane	1.45

SS4

1,2,4-Trimethylbenzene	4.2
1,3,5-Trimethylbenzene	2.19
4-Ethyltoluene	2.57
Acetone	58.2
Carbon Tetrachloride	0.3
Dichlorodifluromethane	2.24
Ethanol	4.05
Ethylbenzene	2.48
Hexane	9.05
Xylene (m&p)	10.5
Methyl Ethyl Ketone	6.57
Methylene Chloride	1.58
Xylene (o)	2.46
Tetrachloroethene	2.29
Toluene	19.4
Trichlorofluoromethane	1.03

SS3

1,2,4-Trimethylbenzene	4.06
1,3,5-Trimethylbenzene	1.61
4-Ethyltoluene	1.04
4-Methyl-2-pentanone	1.23
Acetone	139
Benzene	1.1
Carbon Tetrachloride	0.43
Chloromethane	1.14
Dichlorodifluromethane	1.86
Ethanol	98.3
Ethyl Acetate	1.09
Heptane	1.22
Hexane	2.83
Isopropylalcohol	10.1
Xylene (m&p)	3.66
Methyl Ethyl Ketone	8.69
Methylene Chloride	1.92
Xylene (o)	1.92
Propylene	1.81
Tetrachloroethene	0.26
Toluene	5.39
Trichlorofluoromethane	1.29

SS5

1,2,4-Trimethylbenzene	3.97
1,3,5-Trimethylbenzene	3.02
4-Methyl-2-pentanone	2.54
Acetone	102
Benzene	2.12
Carbon Tetrachloride	0.45
Chloromethane	1.03
Dichlorodifluromethane	1.73
Ethanol	12.9
Ethyl Acetate	2.85
Ethylbenzene	2.3
Heptane	1.53
Hexane	1.76
Isopropylalcohol	3.02
Xylene (m&p)	9.33
Methyl Ethyl Ketone	10.3
MTBE	6.92
Methylene Chloride	2.48
Xylene (o)	5.68
Propylene	2.46
Tetrachloroethene	0.77
Toluene	10.4
Trichlorofluoromethane	1.35

SS2

1,2,4-Trimethylbenzene	3.42
1,3,5-Trimethylbenzene	1.39
4-Ethyltoluene	1.09
Acetone	23.7
Carbon Tetrachloride	0.26
Dichlorodifluromethane	2.15
Ethanol	14.9
Ethylbenzene	1.51
Tetrachloroethene	4.89
Toluene	1.97
Trichlorofluoromethane	1.01

SG4

1,2,4-Trimethylbenzene	2.49
1,3,5-Trimethylbenzene	1.02
Acetone	3,250
Benzene	2.18
Carbon Disulfide	8.81
Carbon Tetrachloride	0.8
Chloromethane	1.25
Dichlorodifluromethane	1.43
Ethanol	78.7
Heptane	111
Hexane	266
Isopropylalcohol	54.3
Xylene (m&p)	1.74
Methyl Ethyl Ketone	65.1
Propylene	139
Tetrachloroethene	3.52
Toluene	2.36
Trichlorofluoromethane	1.11

SG1

1,2,4-Trimethylbenzene	1.63
Acetone	434
Benzene	2.51
Carbon Disulfide	13.9
Carbon Tetrachloride	0.28
Chloromethane	2.64
Dichlorodifluromethane	1.7
Ethanol	13.3
Ethylbenzene	1.19
Heptane	561
Hexane	1310
Isopropylalcohol	5.97
Xylene (m&p)	1.93
Methyl Ethyl Ketone	10.9
Methylene Chloride	2.51
Xylene (o)	1.03
Propylene	61.7
Toluene	2.82
Trichlorofluoromethane	1.01

SG7

1,2,4-Trimethylbenzene	3.35
1,3,5-Trimethylbenzene	1.26
4-Ethyltoluene	2.26
Acetone	582
Benzene	13.6
Carbon Disulfide	34.5
Dichlorodifluromethane	2.08
Ethanol	14.8
Ethylbenzene	2.87
Heptane	290
Hexane	824
Xylene (m&p)	5.51
Xylene (o)	1.59
Propylene	270
Tetrachloroethene	6.26
Toluene	18.8
Trichloroethene	0.43

SG5

1,2,4-Trimethylbenzene	2.76
1,3,5-Trimethylbenzene	1.01
4-Ethyltoluene	1.69
Benzene	10.3
Carbon Disulfide	26.2
Carbon Tetrachloride	0.35
Dichlorodifluromethane	2.11
Ethanol	8.93
Ethylbenzene	2.62
Heptane	3330
Hexane	6200
Xylene (m&p)	3.98
Methyl Ethyl Ketone	12.9
Tetrachloroethene	0.39
Toluene	44.8
Vinyl Chloride	0.28

SG3

1,2,4-Trimethylbenzene	1.08
Acetone	572
Benzene	6.86
Carbon Disulfide	20
Carbon Tetrachloride	0.87
Chloromethane	6.19
Dichlorodifluromethane	1.38
Ethanol	16.1
Heptane	2,240
Hexane	5,880
Isopropylalcohol	10.5
Xylene (m&p)	1.68
Propylene	322
Toluene	10.3
Trichloroethene	0.42
Trichlorofluoromethane	1.12

SG2

1,2,4-Trimethylbenzene	1.64
Acetone	622
Benzene	9.93
Carbon Disulfide	38.3
Carbon Tetrachloride	0.26
Chloromethane	3.74
Dichlorodifluromethane	1.63
Ethanol	10.9
Heptane	2840
Hexane	2520
Isopropylalcohol	6.29
Xylene (m&p)	3.37
Methyl Ethyl Ketone	14.8
Propylene	501
Tetrachloroethene	0.26
Toluene	5.57
Trichlorofluoromethane	1.11

KEY:

Property Line

SGx — Soil Gas Location

SSx — Subslab Vapor Location

**All detections in ug/m^3*

SCALE:

0 30 60

Scale: 1 inch = 60 feet

EBC
Environmental Business Consultants
Phone 631.504.6000
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Figure No. 9

Site Name: Former Mugler Shoring Inc.

Site Address: 2401 Third Avenue, Bronx, NY

Drawing Title: Soil Gas Detections

TABLE 13
Former Mugler Shoring
2401 3rd Avenue, Bronx, NY
Soil Gas - Volatile Organic Compounds

COMPOUNDS	NYSDOH Soil Outdoor Background Levels ($\mu g/m^3$) [a]	SG1 12/1/2015 (µg/m3)				SG2 12/1/2015 (µg/m3)				SG3 12/1/2015 (µg/m3)				SG4 12/1/2015 (µg/m3)			
		Results	RL	Qual	MDL	Results	RL	Qual	MDL	Results	RL	Qual	MDL	Results	RL	Qual	MDL
1,1,1,2-Tetrachloroethane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1,1-Trichloroethane	<2.0 - 2.8	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1,2,2-Tetrachloroethane	<1.5	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1,2-Trichloroethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1-Dichloroethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1-Dichloroethene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2,4-Trichlorobenzene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2,4-Trimethylbenzene	<1.0	**1.63**	1.00		1.00	**1.64**	1.00		1.00	**1.08**	1.00		1.00	**2.49**	1.00		1.00
1,2-Dibromoethane	<1.5	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichlorobenzene	<2.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichloroethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichloropropane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichlorotetrafluoroethane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,3,5-Trimethylbenzene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	**1.02**	1.00		1.00
1,3-Butadiene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,3-Dichlorobenzene	<2.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,4-Dichlorobenzene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,4-Dioxane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
2-Hexanone		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
4-Ethyltoluene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
4-Isopropyltoluene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
4-Methyl-2-pentanone		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Acetone	NA	**434**	29.9	DS	29.9	**622**	29.9	DS	29.9	**572**	29.9	DS	29.9	**3,250**	75.0	DS	75.0
Acrylonitrile		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Benzene	<1.6 - 4.7	**2.51**	1.00		1.00	**9.93**	1.00		1.00	**6.86**	1.00		1.00	**2.18**	1.00		1.00
Benzyl Chloride	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Bromodichloromethane	<5.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Bromoform	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Bromomethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Carbon Disulfide	NA	**13.9**	1.00		1.00	**38.3**	1.00		1.00	**20**	1.00		1.00	**8.81**	1.00		1.00
Carbon Tetrachloride	<3.1	**0.28**	0.25		0.25	**0.26**	0.25		0.25	**0.87**	0.25		0.25	**0.8**	0.25		0.25
Chlorobenzene	<2.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Chloroethane	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Chloroform	<2.4	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Chloromethane	<1.0 - 1.4	**2.64**	1.00		1.00	**3.74**	1.00		1.00	**6.19**	1.00		1.00	**1.25**	1.00		1.00
cis-1,2-Dichloroethene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
cis-1,3-Dichloropropene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Cyclohexane	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Dibromochloromethane	<5.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Dichlorodifluromethane	NA	**1.7**	1.00		1.00	**1.63**	1.00		1.00	**1.38**	1.00		1.00	**1.43**	1.00		1.00
Ethanol		**13.3**	1.00		1.00	**10.9**	1.00		1.00	**16.1**	1.00		1.00	**78.7**	1.00	E	1.00
Ethyl Acetate	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Ethylbenzene	<4.3	**1.19**	1.00		1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Heptane	NA	**561**	30.0	D	30.0	**2840**	30.0	D	30.0	**2,240**	30.0	D	30.0	**111**	1.00		1.00
Hexachlorobutadiene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Hexane	<1.5	**1310**	30.0	DS	30.0	**2520**	30.0	DS	30.0	**5,880**	75.0	DS	75.0	**266**	30.0	DS	30.0
Isopropylalcohol	NA	**5.97**	1.00	S	1.00	**6.29**	1.00	S	1.00	**10.5**	1.00		1.00	**54.3**	1.00		1.00
Isopropylbenzene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Xylene (m&p)	<4.3	**1.93**	1.00		1.00	**3.37**	1.00		1.00	**1.68**	1.00		1.00	**1.74**	1.00		1.00
Methyl Ethyl Ketone		**10.9**	1.00		1.00	**14.8**	1.00		1.00	< 1.00	1.00	U	1.00	**65.1**	1.00		1.00
MTBE	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Methylene Chloride	<3.4	**2.51**	1.00	S	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
n-Butylbenzene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Xylene (o)	<4.3	**1.03**	1.00		1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Propylene	NA	**61.7**	29.9	D	29.9	**501**	29.9	D	29.9	**322**	29.9	D	29.9	**139**	29.9	D	29.9
sec-Butylbenzene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Styrene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Tetrachloroethene		< 0.25	0.25	U	0.25	**0.26**	0.25		0.25	< 0.25	0.25	U	0.25	**3.52**	0.25		0.25
Tetrahydrofuran	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Toluene	1.0 - 6.1	**2.82**	1.00		1.00	**5.57**	1.00		1.00	**10.3**	1.00		1.00	**2.36**	1.00		1.00
trans-1,2-Dichloroethene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
trans-1,3-Dichloropropene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Trichloroethene	<1.7	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	**0.42**	0.25		0.25	< 0.25	0.25	U	0.25
Trichlorofluoromethane	NA	**1.01**	1.00		1.00	**1.11**	1.00		1.00	**1.12**	1.00		1.00	**1.11**	1.00		1.00
Trichlorotrifluoroethane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Vinyl Chloride	<1.0	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25
Total CVOCs		**0.28**				**0.5**				**1.3**				**4.32**			
BTEX		**9.48**				**18.87**				**18.84**				**6.28**			
Total VOCs		**2430.02**				**6,580.80**				**9090.50**				**3,990.81**			

Notes:
NA = No guidance value or standard available
(a) = NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, February 2005, Summary of Background Levels for Selected
RL = Laboratory detection limit
Bold = Result detected above detection limit
VOCs = Volatile Organic Compounds
CVOCs = Chlorinated Volatile Organic Compounds
BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes

U	The compound was anlayzed for but not detected at or above the MDL. The number immediately preceding the "U" represents the PQL reporting level corrected for percent solids, weight and/or volume calculations, and dilution factors.
J	The value is estimated. This flag is used a) on form 1 when the compound is reported above the MDL, but below the PQL, and b) on the Tentatively Identified Compounds (TIC) form for all compounds identified.
N	The concentration is based on the response fo the nearest internal. This flag is used on the TIC form for all compounds identified.
S	This compound is a solvent that is used in the laboratory. Laboratory contamination is suspected if concentration is less than five times the reporting level.
D	The reported concentration is the result of a diluted analysis.

TABLE 13
Former Mugler Shoring
2401 3rd Avenue, Bronx, NY
Soil Gas - Volatile Organic Compounds

COMPOUNDS	NYSDOH Soil Outdoor Background Levels ($\mu g/m^3$) [a]	SG5 12/1/2015 (µg/m3)				SG7 12/1/2015 (µg/m3)				SG8 12/1/2015 (µg/m3)				SG9 12/1/2015 (µg/m3)			
		Results	RL	Qual	MDL	Results	RL	Qual	MDL	Results	RL	Qual	MDL	Results	RL	Qual	MDL
1,1,1,2-Tetrachloroethane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1,1-Trichloroethane	<2.0 - 2.8	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	**1.02**	1.00		1.00
1,1,2,2-Tetrachloroethane	<1.5	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1,2-Trichloroethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1-Dichloroethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1-Dichloroethene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2,4-Trichlorobenzene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2,4-Trimethylbenzene	<1.0	**2.76**	1.00		1.00	**3.35**	1.00		1.00	**2.94**	1.00		1.00	**2.61**	1.00		1.00
1,2-Dibromoethane	<1.5	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichlorobenzene	<2.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichloroethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichloropropane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichlorotetrafluoroethane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,3,5-Trimethylbenzene	<1.0	**1.01**	1.00		1.00	**1.26**	1.00		1.00	**1.13**	1.00		1.00	< 1.00	1.00	U	1.00
1,3-Butadiene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,3-Dichlorobenzene	<2.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,4-Dichlorobenzene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,4-Dioxane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
2-Hexanone		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	**5.61**	1.00		1.00	< 1.00	1.00	U	1.00
4-Ethyltoluene	NA	**1.69**	1.00		1.00	**2.26**	1.00		1.00	**1.85**	1.00		1.00	**1.6**	1.00		1.00
4-Isopropyltoluene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
4-Methyl-2-pentanone		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Acetone	NA	< 1.00	1.00	U	1.00	**582**	9.99	DS	9.99	**2850**	75.0	DS	75.0	**118**	5.01	DS	5.01
Acrylonitrile		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Benzene	<1.6 - 4.7	**10.3**	1.00		1.00	**13.6**	1.00		1.00	< 1.00	1.00	U	1.00	**1.75**	1.00		1.00
Benzyl Chloride	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Bromodichloromethane	<5.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Bromoform	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Bromomethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Carbon Disulfide	NA	**26.2**	1.00		1.00	**34.5**	1.00		1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Carbon Tetrachloride	<3.1	**0.35**	0.25		0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25
Chlorobenzene	<2.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Chloroethane	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Chloroform	<2.4	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Chloromethane	<1.0 - 1.4	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
cis-1,2-Dichloroethene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
cis-1,3-Dichloropropene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Cyclohexane	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Dibromochloromethane	<5.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Dichlorodifluromethane	NA	**2.11**	1.00		1.00	**2.08**	1.00		1.00	**2.03**	1.00		1.00	**27.2**	1.00		1.00
Ethanol		**8.93**	1.00	S	1.00	**14.8**	1.00		1.00	**78.7**	1.00	E	1.00	< 1.00	1.00	U	1.00
Ethyl Acetate	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Ethylbenzene	<4.3	**2.62**	1.00		1.00	**2.87**	1.00		1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Heptane	NA	**3330**	30.0	D	30.0	**290**	9.99	D	9.99	**2.51**	1.00		1.00	**14.8**	1.00		1.00
Hexachlorobutadiene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Hexane	<1.5	**6200**	75.0	DS	75.0	**824**	10.0	DS	10.0	< 1.00	1.00	U	1.00	**117**	1.00		1.00
Isopropylalcohol	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Isopropylbenzene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Xylene (m&p)	<4.3	**3.98**	1.00		1.00	**5.51**	1.00		1.00	**1.51**	1.00		1.00	**1.53**	1.00		1.00
Methyl Ethyl Ketone		**12.9**	1.00		1.00	< 1.00	1.00	U	1.00	**40.7**	1.00		1.00	< 1.00	1.00	U	1.00
MTBE	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Methylene Chloride	<3.4	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
n-Butylbenzene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Xylene (o)	<4.3	< 1.00	1.00	U	1.00	**1.59**	1.00		1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Propylene	NA	< 1.00	1.00	U	1.00	**270**	9.99	D	9.99	**7.88**	1.00		1.00	< 1.00	1.00	U	1.00
sec-Butylbenzene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Styrene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Tetrachloroethene		**0.39**	0.25		0.25	**6.26**	0.25		0.25	**2.64**	0.25		0.25	**15.8**	0.25		0.25
Tetrahydrofuran	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Toluene	1.0 - 6.1	**44.8**	1.00		1.00	**18.8**	1.00		1.00	**1.23**	1.00		1.00	**1.55**	1.00		1.00
trans-1,2-Dichloroethene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
trans-1,3-Dichloropropene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Trichloroethene	<1.7	< 0.25	0.25	U	0.25	**0.43**	0.25		0.25	**0.27**	0.25		0.25	**9.24**	0.25		0.25
Trichlorofluoromethane	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	**1.45**	1.00		1.00	**11.9**	1.00		1.00
Trichlorotrifluoroethane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Vinyl Chloride	<1.0	**0.28**	0.25		0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25
Total CVOCs		**0.74**				**6.69**				**2.91**				**26.06**			
BTEX		**61.7**				**42.37**				**2.74**				**4.83**			
Total VOCs		**9,648.32**				**2,073.31**				**3,000.45**				**324.00**			

Notes:
NA = No guidance value or standard available
(a) = NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, February 2005, Summary of Background Levels for Selected
RL = Laboratory detection limit
Bold = Result detected above detection limit
VOCs = Volatile Organic Compounds
CVOCs = Chlorinated Volatile Organic Compounds
BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes

U	The compound was anlayzed for but not detected at or above the MDL. The number immediately preceding the "U" represents the PQL reporting level corrected for percent solids, weight and/or volume calculations, and dilution factors.
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N	The concentration is based on the response fo the nearest internal. This flag is used on the TIC form for all compounds identified.
S	This compound is a solvent that is used in the laboratory. Laboratory contamination is suspected if concentration is less than five times the reporting level.
D	The reported concentration is the result of a diluted analysis.

TABLE 13
Former Mugler Shoring
2401 3rd Avenue, Bronx, NY
Soil Gas - Volatile Organic Compounds

COMPOUNDS	NYSDOH Soil Outdoor Background Levels (µg/m³) [a]	SS1 12/2/2015 (µg/m3)				SS2 12/1/2015 (µg/m3)				SS3 12/2/2015 (µg/m3)				SS4 12/1/2015 (µg/m3)				SS5 12/2/2015 (µg/m3)			
		Results	RL	Qual	MDL	Results	RL	Qual	MDL	Results	RL	Qual	MDL	Results	RL	Qual	MDL	Results	RL	Qual	MDL
1,1,1,2-Tetrachloroethane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1,1-Trichloroethane	<2.0 - 2.8	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1,2,2-Tetrachloroethane	<1.5	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1,2-Trichloroethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1-Dichloroethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,1-Dichloroethene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2,4-Trichlorobenzene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2,4-Trimethylbenzene	<1.0	**6.09**	1.00		1.00	**3.42**	1.00		1.00	**4.06**	1.00		1.00	**4.2**	1.00		1.00	**3.97**	1.00		1.00
1,2-Dibromoethane	<1.5	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichlorobenzene	<2.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichloroethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichloropropane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,2-Dichlorotetrafluoroethane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,3,5-Trimethylbenzene	<1.0	**2.56**	1.00		1.00	**1.39**	1.00		1.00	**1.61**	1.00		1.00	**2.19**	1.00		1.00	**3.02**	1.00		1.00
1,3-Butadiene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,3-Dichlorobenzene	<2.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,4-Dichlorobenzene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
1,4-Dioxane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
2-Hexanone		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
4-Ethyltoluene	NA	**1.51**	1.00		1.00	**1.09**	1.00		1.00	**1.04**	1.00		1.00	**2.57**	1.00		1.00	< 1.00	1.00	U	1.00
4-Isopropyltoluene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
4-Methyl-2-pentanone		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	**1.23**	1.00		1.00	< 1.00	1.00	U	1.00	**2.54**	1.00		1.00
Acetone	NA	**53.2**	1.00		1.00	**23.7**	1.00		1.00	**139**	5.01	DS	5.01	**58.2**	1.00		1.00	**102**	5.01	DS	5.01
Acrylonitrile		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Benzene	<1.6 - 4.7	**1.28**	1.00		1.00	< 1.00	1.00	U	1.00	**1.1**	1.00		1.00	< 1.00	1.00	U	1.00	**2.12**	1.00		1.00
Benzyl Chloride	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Bromodichloromethane	<5.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Bromoform	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Bromomethane	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Carbon Disulfide	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Carbon Tetrachloride	<3.1	**0.46**	0.25		0.25	**0.26**	0.25		0.25	**0.43**	0.25		0.25	**0.3**	0.25		0.25	**0.45**	0.25		0.25
Chlorobenzene	<2.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Chloroethane	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Chloroform	<2.4	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Chloromethane	<1.0 - 1.4	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	**1.14**	1.00		1.00	< 1.00	1.00	U	1.00	**1.03**	1.00		1.00
cis-1,2-Dichloroethene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
cis-1,3-Dichloropropene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Cyclohexane	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Dibromochloromethane	<5.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Dichlorodifluromethane	NA	**1.8**	1.00		1.00	**2.15**	1.00		1.00	**1.86**	1.00		1.00	**2.24**	1.00		1.00	**1.73**	1.00		1.00
Ethanol		**14.2**	1.00		1.00	**14.9**	1.00		1.00	**98.3**	5.01	DS	5.01	**4.05**	1.00	S	1.00	**12.9**	1.00		1.00
Ethyl Acetate	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	**1.09**	1.00		1.00	< 1.00	1.00	U	1.00	**2.85**	1.00		1.00
Ethylbenzene	<4.3	**1.12**	1.00		1.00	**1.51**	1.00		1.00	< 1.00	1.00	U	1.00	**2.48**	1.00		1.00	**2.3**	1.00		1.00
Heptane	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	**1.22**	1.00		1.00	< 1.00	1.00	U	1.00	**1.53**	1.00		1.00
Hexachlorobutadiene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Hexane	<1.5	**3.14**	1.00	S	1.00	< 1.00	1.00	U	1.00	**2.83**	1.00	S	1.00	**9.05**	1.00	S	1.00	**1.76**	1.00	S	1.00
Isopropylalcohol	NA	**1.46**	1.00	S	1.00	< 1.00	1.00	U	1.00	**10.1**	1.00		1.00	< 1.00	1.00	U	1.00	**3.02**	1.00	S	1.00
Isopropylbenzene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Xylene (m&p)	<4.3	**5.55**	1.00		1.00	< 1.00	1.00	U	1.00	**3.66**	1.00		1.00	**10.5**	1.00		1.00	**9.33**	1.00		1.00
Methyl Ethyl Ketone		**5.13**	1.00		1.00	< 1.00	1.00	U	1.00	**8.69**	1.00		1.00	**6.57**	1.00		1.00	**10.3**	1.00		1.00
MTBE	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	**6.92**	1.00		1.00
Methylene Chloride	<3.4	**1.68**	1.00	S	1.00	< 1.00	1.00	U	1.00	**1.92**	1.00	S	1.00	**1.58**	1.00	S	1.00	**2.48**	1.00	S	1.00
n-Butylbenzene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Xylene (o)	<4.3	**2.91**	1.00		1.00	< 1.00	1.00	U	1.00	**1.92**	1.00		1.00	**2.46**	1.00		1.00	**5.68**	1.00		1.00
Propylene	NA	**2.68**	1.00		1.00	< 1.00	1.00	U	1.00	**1.81**	1.00		1.00	< 1.00	1.00	U	1.00	**2.46**	1.00		1.00
sec-Butylbenzene		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Styrene	<1.0	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Tetrachloroethene		**0.37**	0.25		0.25	**4.89**	0.25		0.25	**0.26**	0.25		0.25	**2.29**	0.25		0.25	**0.77**	0.25		0.25
Tetrahydrofuran	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Toluene	1.0 - 6.1	**3.14**	1.00		1.00	**1.97**	1.00		1.00	**5.39**	1.00		1.00	**19.4**	1.00		1.00	**10.4**	1.00		1.00
trans-1,2-Dichloroethene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
trans-1,3-Dichloropropene	NA	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Trichloroethene	<1.7	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25
Trichlorofluoromethane	NA	**1.33**	1.00		1.00	**1.01**	1.00		1.00	**1.29**	1.00		1.00	**1.03**	1.00		1.00	**1.35**	1.00		1.00
Trichlorotrifluoroethane		< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00	< 1.00	1.00	U	1.00
Vinyl Chloride	<1.0	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25	< 0.25	0.25	U	0.25
Total CVOCs		**0.83**				**5.15**				**0.69**				**2.59**				**1.22**			
BTEX		**14**				**3.48**				**12.07**				**34.84**				**29.83**			
Total VOCs		**109.61**				**56.29**				**289.95**				**129.11**				**190.91**			

Notes:
NA = No guidance value or standard available
(a) = NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, February 2005, Summary of Background Levels for Selected
RL = Laboratory detection limit
Bold = Result detected above detection limit
VOCs = Volatile Organic Compounds
CVOCs = Chlorinated Volatile Organic Compounds
BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes

U	The compound was anlayzed for but not detected at or above the MDL. The number immediately preceding the "U" represents the PQL reporting level corrected for percent solids, weight and/or volume calculations, and dilution factors.
J	The value is estimated. This flag is used a) on form 1 when the compound is reported above the MDL, but below the PQL, and b) on the Tentatively Identified Compounds (TIC) form for all compounds identified.
N	The concentration is based on the response fo the nearest internal. This flag is used on the TIC form for all compounds identified.
S	This compound is a solvent that is used in the laboratory. Laboratory contamination is suspected if concentration is less than five times the reporting level.
D	The reported concentration is the result of a diluted analysis.

APPENDIX E

Excavation Work Plan

Excavation Work Plan

Former Mugler Shoring Inc.
2401 Third Avenue
Bronx, New York

August 20, 2020

Prepared for:

BOP 2401 Third Avenue, LLC
Brookfield Place
250 Vesey Street
15th Floor
New York, New York 10281

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

3171.0001Y133/APD-CV

APPENDIX D – EXCAVATION WORK PLAN (EWP)

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

Table 1: Notifications*

Mandy Yau, NYSDEC	718-482-4897 mandy.yau@dec.ny.gov
Jane O'Connell, NYSDEC	718-482-4599 jane.oconnell@dec.ny.gov
Steven Berninger, NYSDOH	518-402-7860 Steven.berninger@health.ny.gov

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

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 below the soil cover, 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 E of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

D-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover 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 D-6 and D-7, respectively of this Appendix.

D-3 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.

Water will be available onsite at suitable supply and pressure for use in dust control.

D-4 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 (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. 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 wash will be operated on-site, as appropriate. The qualified environmental professional or their designated representative will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete Truck wash waters will be collected and disposed of off-site in an appropriate manner.

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

The qualified environmental professional or their designated representative 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.

D-5 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.

Truck transport routes are as follows:

Trucks will enter the site from the Major Deegan Expressway (I-87) heading south; take the Willis Ave / Third Ave Exit (Exit 2) and turn right heading north on Bruckner Boulevard. to Third Avenue. Turn left, heading west on Third Avenue one block to Site entrance on the left.

Trucks will exit the site and turn left onto Third Avenue heading northeast to 138th Street. Turn right onto 138th Street heading southeast to Willis Avenue. Turn right onto Willis Avenue heading south to E. 135th Street. Turn right on E. 135th Street and continue to the on-ramp (bearing left) to head north on the Major Deegan Expressway (I-87).

A truck route map is included as Figure X. All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route

and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

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 minimized to the extent practical.

D-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State 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 debris recovery 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 consistent with 6NYCRR Parts 360, 361, 362, 363, 364 and 365. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State C&D debris recovery facility (6NYCRR Subpart 361-5 registered or permitted facility).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the Division of Materials Management (DMM) in NYSDEC to be C&D materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C&D facility without permit modifications only upon prior notification of NYSDEC Region 2 DMM.

D-7 MATERIALS REUSE ON-SITE

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain onsite. Contaminated onsite 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.

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.

Sampling and analysis of excavated backfill to qualify for unrestricted or restricted residential uses or onsite/offsite reuse will be performed in accordance with the Field Sampling Plan for the Site (Appendix A in this EWP). Representative sampling will be in accordance with DER-10.

D-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, 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. Liquids discharged into the New York City sewer system will be addressed through approval by the NYCDEP, as necessary.

D-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the RAWP. The existing cover system for the majority of the Site will be comprised of building foundations. The remainder of the Site currently contains a cover system that is comprised of 2 feet of stone overlying a demarcation layer. Following completion of redevelopment construction activities and utility installation, a final cover system will be installed in areas outside of the buildings' foundation and will comprise of pavement, sidewalks, pavers, or a minimum of 24 inches of clean soil. The demarcation layer, consisting of orange snow fencing material will be replaced to provide a visual reference to the top of the remaining contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP.

D-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 Table 2. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

A pre-determined Beneficial Use Determination (BUD) may be applicable for use of recycled concrete aggregate with less than 10 percent passing a number 80 sieve sourced from a NYSDEC registered Construction and Demolition Debris processing facility. A site-specific BUD may be requested under certain circumstances for soil from environmental remediation sites or other sources.

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.

D-11 STORMWATER POLLUTION PREVENTION

Erosion and sediment controls to be installed during future disturbance of residual contamination, if required, will be in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control. As required, silt fence, 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.

D-12 EXCAVATION CONTINGENCY PLAN

During the remedial action, a total of seven underground storage tanks were uncovered and properly cleaned and disposed of offsite by a licensed tank contractor and it is unlikely there are others present due to the extensive work completed onsite.

In the unlikely event that additional 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.

D-13 COMMUNITY AIR MONITORING PLAN

The CAMP is included within Appendix N of the HASP, which is located in Appendix E of this SMP. The location of air sampling stations will be based on generally prevailing wind conditions at the Site. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and a downwind monitoring station.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

D-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site. Specific odor control methods to be used on a routine basis will include the use of odor suppressants and controlled excavation procedures, as discussed below. If nuisance odors are

identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

D-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved though the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.

- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

D-16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior intrusive excavation work.

A plan will be developed and utilized by the contractor for all intrusive excavation work to ensure compliance with local noise control ordinances.

APPENDIX A

Quality Assurance Project Plan/
Field Sampling Plan

Quality Assurance Project Plan/Field Sampling Plan

Former Mugler Shoring Inc.
2401 Third Avenue
Bronx, New York

August 20, 2020

Prepared for:

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Prepared by:

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1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of BOP 2401 Third Avenue, LLC has prepared this Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) to describe the measures that will be taken to ensure the data generated during any additional environmental sampling during the implementation of the Site Management Plan (SMP) for the Former Mugler Shoring Inc. site located at 2401 Third Avenue, Bronx, New York are of quality sufficient to meet project-specific data quality objectives (DQOs). This QAPP/FSP also includes field sampling procedures. This QAPP/FSP supersedes the QAPP included as an appendix to the approved Remedial Action Work Plan (RAWP) dated August 2016, prepared by Environmental Business Consultants (EBC).

BOP 2401 Third Avenue, LLC is a Volunteer in the Brownfield Cleanup Program (BCP). Remediation activities will be conducted under the New York State Department of Environmental Conservation (NYSDEC) BCP (Site # C203052). This QAPP/FSP was prepared in accordance with the guidance provided in NYSDEC Technical Guidance DER-10 Technical Guidance for Site Investigation and Remediation (DER-10), the NYSDEC BCP Guide, and the United States Environmental Protection Agency's (USEPA's) Guidance for the Data Quality Objectives Process (EPA QA/G 4).

1.1 Purpose

The QAPP/FSP describes in detail the field sampling and quality assurance/quality control (QA/QC) methods to be used during the implementation of the SMP.

This QAPP/FSP was prepared in accordance with the NYSDEC's DER-10 and provides guidelines and procedures to be followed by field personnel during implementation of the SMP. Information contained in this QAPP/FSP relates to:

- Sampling objectives (Section 2);
- Project organization (Section 3);
- Sample media, sampling locations, analytical suites, sampling frequencies and analytical laboratory (Section 4);
- Field sampling procedures (Section 5);
- Sample handling, sample analysis, and quality assurance/quality control (Section 6); and
- Site control procedures and decontamination (Section 7).

2. Project Organization

A general and generic summary of the overall management structure and responsibilities of project team members are presented below.

Project Principal

Frank Cherena of Roux will serve as Project Principal. The Project Principal is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the Investigation.

Remedial Engineer

The Remedial Engineer for this project will be Ms. Noelle Clarke, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the Investigation and future remedial program for the site. The Remedial Engineer will certify that the investigation activities were observed by qualified environmental professionals under her supervision as well as any other relevant provisions of ECL 27-1419 have been achieved in full conformance with the Investigation.

Project Manager

Lauren Dolginko of Roux will serve as Project Manager. The Project Manager is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the work. This individual will provide overall management for the implementation of the scope of work and will coordinate all field activities. The Project Manager is also responsible for data review/interpretation and report preparation.

Field Team Leader

The Field Team Leader will be determined prior to the start of Work. The Field Team Leader bears the responsibility for the successful execution of the field program. The Field Team Leader will direct the activities of the technical staff in the field, as well as all subcontractors. The Field Team Leader will also assist in the interpretation of data and in report preparation. The Field Team Leader reports to the Project Manager.

Laboratory Project Manager

The Laboratory Project Manager will be determined prior to the start of the Work. The Laboratory Project Manager is responsible for sample container preparation, sample custody in the laboratory, and completion of the required analysis through oversight of the laboratory staff. The Laboratory Project Manager will ensure that quality assurance procedures are followed and that an acceptable laboratory report is prepared and submitted. The Laboratory Project Manager reports to the Field Team Leader.

Quality Assurance Officer

David Kaiser, P.E. of Roux will serve as the Quality Assurance Officer (QAO) for this project. The QAO is responsible for conducting reviews, inspections, and audits to ensure that the data collection is conducted in accordance with QAPP/FSP. The QAO's responsibilities range from ensuring effective field equipment decontamination procedures and proper sample collection to the review of all laboratory analytical data for completeness and usefulness. The QAO reports to the Project Manager and makes independent recommendations to the Field Team Leader.

3. Sample Media, Locations, Analytical Suites, and Frequency

The anticipated media to be sampled during the SMP is soil. Sampling locations, analytical suites, and frequency may vary by location and type of soil sampling. Specifics regarding the sample collection procedures are provided in Section 5 of this QAPP/FSP.

3.1 Waste Characterization Soil Sampling

Waste Characterization soil samples may need to be collected in the event that onsite excavation and offsite disposal of soil is needed under the SMP. QA/QC samples are not required for waste characterization soil sampling.

Grab soil samples will be analyzed for the following list of parameters:

- Target Compound List (TCL)/New Jersey Soil Remediation Standards (SRS) VOCs (+10);
- Toxicity Characteristic Leaching Procedure (TCLP) VOCs; and
- Percent Moisture.

Composite soil samples will be analyzed for the following list of parameters:

- TCL/SRS Semivolatile Organic Compounds (SVOCs +20);
- Target Analyte List (TAL) Metals plus Mercury;
- Hexavalent/Trivalent Chromium;
- Polychlorinated Biphenyls (PCBs);
- TCL/SRS Pesticides;
- Extractable Petroleum Hydrocarbon (EPH);
- Herbicides;
- Total Cyanide;
- Resource Conservation and Recovery Act (RCRA) Characteristics including Reactivity, Ignitability, and Corrosivity;
- TCLP Metals RCRA 8 plus Mercury;
- TCLP SVOCs;
- TCLP Pesticides; and
- TCLP Herbicides.

All waste characterization soil samples will be analyzed at a laboratory with a current New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) Contract Laboratory Protocol (CLP) certification for each of the parameters noted above. Samples will be analyzed on a standard (5-day) turnaround time. Analytical results will be reported as Category B data deliverables.

3.2 Offsite Backfill/Onsite Reuse Soil Sampling

For offsite fill/onsite reuse soil materials requiring chemical testing, the following samples shall be collected:

- One sample for pre-qualification chemical testing at the source location, including the following:
  1. Chemical testing shall be performed at a minimum for the parameters listed in Table 375-6.8(b) of the latest revision of Part 375. Samples will be analyzed by the following analytical methods:
  2. Backfill/onsite reuse soil materials excluding gravel, rock, stone and RCA meeting specific gradation requirements that do not require sampling as described below, shall meet criteria presented in Section 2.
  3. Backfill/onsite reuse soil materials that exceed the criteria presented in Section 2 shall not be imported to the Site without prior approval of the NYSDEC.
  4. The backfill/onsite reuse soil material will be free of extraneous debris or solid waste.
  5. If the NYSDEC agrees that the material originated from a virgin source, then a minimum of one sample (i.e., the pre-qualification sample) will be collected and analyzed per source.
- If the source is not virgin, the sampling frequency will comply with DER-10 Table 5.4(e)10 shown below:

Table 5.4(e)10
Recommended Number of Soil Samples for Soil Imported To or Exported From a Site

Contaminant	VOCs	SVOCs, Inorganics & PCBs/Pesticides	
Soil Quantity (cubic yards)	**Discrete Samples**	**Composite**	**Discrete Samples/Composite**
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
➢ 1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

The source of the offsite fill/onsite reuse soil must be documented by the supplier, including the location where the fill/onsite reuse soil was obtained and a brief history of the site that is the source of the fill.

Samples of offsite backfill/onsite reuse soil will be analyzed for the following parameters:

- TCL/Part 375 VOC + 10 TICs;
- TCL/Part 375 BNA/SVOCs + 20;
- TCL/Part 375 Pesticides;
- TCL/Part 375 Herbicides;
- TCL/Part 375 PCBs;
- TAL/Part 375 Metals (including hexavalent chromium);
- Total Cyanide; and
- Emerging Contaminants (for soil import only).*

*ECs list includes 1,4-Dioxane and the 21 Per- and Polyfluoroalkyl Substances (PFAS) which include the 21 compounds listed in the NYSDEC June 2019 Sampling for 1,4-Dioxane and PFAS Under DEC's Part 375 Remedial Programs (NYSDEC June2019 Guidance), included as Attachment 1. PFAS in soil will be analyzed by USEPA Method 537 Modified and 1,4-Dioxane in soil will be analyzed by USEPA Method 8270D. Soil samples placed on hold at the laboratory will not be analyzed for ECs. The 21 PFAS are:

- Perfluorobutanesulfonic acid
- Perfluorohexanesulfonic acid
- Perfluoroheptanesulfonic acid
- Perfluorooctancessulfonic acid
- Perfluorodecanesulfonic acid
- Perfluorobutanoics acid
- Perfluoropentanoic acid
- Perfluorohexanoic acid
- Perfluoroheptanoic acid
- Perfluorooctanoic acid
- Perfluorononanoic acid
- Perfluorodecanoic acid
- Perfluoroundecanoic acid
- Perfluorododecanoic acid
- Perfluorotridecanoic acid
- Perfluorotetradecanoic acid
- 6:2 Fluorotelomer sulfonate
- 8:2 Fluorotelomer sulfonate
- Perfluroroctanesulfonamide
- N-methyl perfluorooctanesulfonamidoacetic acid
- N-ethyl perfluorooctanesulfonamidoacetic acid

The parameters to be sampled are listed on Table 375-6.8(b) of the latest revision of Part 375. QA/QC samples are not required for backfill/onsite reuse soil samples. All PFAS compounds, listed above, will be analyzed and reported to 1 microgram per kilogram (ug/kg). 1,4-Dioxane will be analyzed and reported to 0.1 milligram per kilogram (mg/kg).

The following materials may be imported, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the site cover, provided that it contains less than 10 percent by weight material that would pass through a size 80 sieve and consists of:

- Gravel, rock or stone, consisting of virgin material from a permitted mine or quarry; or
- Recycled concrete or brick from a NYSDEC registered construction and demolition debris processing facility if the material conforms to the requirements of Section 304 of the 2002 New York State Department of Transportation Standard Construction and Materials Volume 1.

All offsite backfill and onsite reuse samples will be analyzed at a laboratory with a current NYSDOH ELAP CLP certification for each of the parameters noted above. Samples will be analyzed on a standard (5-day) turnaround time. Analytical results will be reported as Category B data deliverables.

4. Field Sampling Procedures

This section provides a detailed discussion of the field procedures to be used during sampling of soil samples under the SMP. Additional details regarding sampling procedures and protocols are described in Roux's relevant Standard Operating Procedures (SOPs), which are provided in Attachment 1. The types of containers, volumes, and preservation techniques for the aforementioned testing parameters are presented in Table 1.

4.1 Waste Characterization Soil Sampling

Procedures for the collection of soil waste characterization samples are provided below.

One waste characterization sample will be collected per 800 cubic yards (CY) of soil excavated for redevelopment purposes, unless another frequency is requested by the disposal facility. Waste characterization sample will be collected as a 5-point composite (except for VOCs which will be grab samples) to ensure a representative sample is collected. Each sample, upon collection, will immediately be placed into a Ziploc® bag. After a minimum of 15 minutes for equilibration with the headspace in the Ziploc® bag, the soil was screened for VOCs using a PID. Following PID screening, soil samples will be placed into pre-cleaned sample jars and placed on ice in a cooler at 4°C.

Additional details regarding soil sampling protocols are described in Roux's Standard Operating Procedure for the Collection of Soil Samples for Laboratory Analysis, which is provided in Attachment 1.

4.2 Offsite Backfill/Onsite Reuse Soil Sampling

Procedures for the collection of offsite backfill and onsite reuse soil samples are provided below.

Soil samples will be collected in accordance with and at the frequency outlined in DER-10 Table 5.4(e)10. Composite samples will be collected as a 5-point composite (except for VOCs which will be grab samples) to ensure a representative sample is collected. Each sample, upon collection, will immediately be placed into a Ziploc® bag. After a minimum of 15 minutes for equilibration with the headspace in the Ziploc® bag, the soil was screened for VOCs using a PID. Following PID screening, soil samples will be placed into pre-cleaned sample jars and placed on ice in a cooler at 4°C.

Additional details regarding soil sampling protocols are described in Roux's Standard Operating Procedure for the Collection of Soil Samples for Laboratory Analysis, which is provided in Attachment 1.

5. Sample Handling and Analysis

To ensure quality data acquisition and collection of representative samples, there are selective procedures to minimize sample degradation or contamination. These include procedures for preservation of the samples, as well as sample packaging, and shipping procedures.

5.1 Sample Custody Documentation

The purpose of documenting sample custody is to ensure the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis (and return of unused sample portion, if applicable).

Each individual collecting samples is personally responsible for the care and custody of the samples. All sample labels should be pre-printed or filled out using waterproof ink. The technical staff will review all field activities with the Field Team Leader to determine whether proper custody procedures were followed during the field work and to decide if additional samples are required.

All samples being shipped offsite for analysis must be accompanied by a properly completed chain of custody form. The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, 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/from a secure storage area, and to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and/or secured with strapping tape in at least two locations for shipment to the laboratory.

5.2 Sample Shipment

If sample shipment is necessary, sample packaging and shipping procedures are based upon USEPA specifications, as well as DOT regulations. The procedures vary according to potential sample analytes, concentration, and matrix and are designed to provide optimum protection for the samples and the public. Sample packaging and shipment must be performed using the general outline described below.

All samples will be shipped within 24 hours of collection and will be preserved appropriately from the time of sample collection. A description of the sample packing and shipping procedures is presented below:

1. Prepare cooler(s) for shipment:
   - tape drain(s) of cooler shut;
   - affix “This Side Up” arrow labels and “Fragile” labels on each cooler; and
   - place mailing label with laboratory address on top of cooler(s).
2. Arrange sample containers in groups by sample number.
3. Ensure that all bottle labels are completed correctly. Place clear tape over bottle labels to prevent moisture accumulation from causing the label to peel off.
4. Arrange containers in front of assigned coolers.
5. Place packaging material approximately at the bottom of the cooler to act as a cushion for the sample containers.

6. Arrange containers in the cooler so that they are not in contact with the cooler or other samples.
7. Fill remaining spaces with packaging material.
8. Ensure all containers are firmly packed in packaging material.
9. If ice is required to preserve the samples, ice cubes should be repackaged in Ziploc® bags and placed on top of the packaging material.
10. Sign chain of custody form (or obtain signature) and indicate the time and date it was relinquished to courier as appropriate.
11. Separate chain of custody forms. Seal proper copies within a large Ziploc® bag and tape to inside cover of cooler. Retain copies of all forms.
12. Close lid and latch.
13. Secure each cooler using custody seals.
14. Tape cooler shut on both ends.
15. Relinquish to overnight delivery service as appropriate. Retain air bill receipt for project records. (Note: All samples will be shipped for "NEXT A.M." delivery).

5.4 Quality Assurance/Quality Control

A laboratory SOP for analysis of PFAS is included in Attachment 1.

The primary DQO of the soil sampling is that data be accurate and precise, thus, representative of the actual Site conditions. Accuracy refers to the ability of the laboratory to obtain a true value (i.e., compared to a standard) and is assessed through the use of laboratory quality control (QC) samples, including laboratory control samples and matrix spike samples, as well as through the use of surrogates, which are compounds not typically found in the environment that are injected into the samples prior to analysis. Precision refers to the ability to replicate a value and is assessed through laboratory duplicate samples. QA/QC samples are not required for backfill/on-Site reuse soil samples.

Sensitivity is also a critical issue in generating representative data. Laboratory equipment must be of sufficient sensitivity to detect target compounds and analytes at levels below NYSDEC standards and guidelines whenever possible. Equipment sensitivity can be decreased by field or laboratory contamination of samples, and by sample matrix effects. Assessment of instrument sensitivity is performed through the analysis of reagent blanks, near-detection-limit standards, and response factors.

Table 2 lists the requirements for laboratory QC samples that will be analyzed to assess data accuracy and precision, as well as to determine if equipment sensitivity has been compromised. Table 1 lists the preservation, holding times and sample container information.

All analyses will be performed in accordance with the NYSDEC Analytical Services Protocol (ASP), using USEPA SW 846 methods.

All laboratory data are to be reported in NYSDEC ASP Category B deliverables and will be delivered to NYSDEC in electronic data deliverable (EDD) format as described on NYSDEC's website (http://www.dec.ny.gov/chemical/62440.html).

6. Site Control Procedures

Site control procedures, including decontamination and waste handling and disposal, are discussed below. Site control procedures have been developed to minimize both the risk of exposure to contamination and the spread of contamination during field activities at the site. All personnel who come into designated work areas, including contractors and observers, will be required to adhere strictly to the conditions imposed herein and to the provisions of a Site-Specific Health and Safety Plan (HASP).

6.1 Decontamination

In an attempt to avoid the spread of contamination, all drilling and sampling equipment must be decontaminated at a reasonable frequency in a properly designed and located decontamination area. Detailed procedures for the decontamination of field and sampling equipment are included in Roux's SOPs for the Decontamination of Field Equipment located in Attachment 1. The location of the decontamination area will be determined prior to the start of field operations. The decontamination area will be constructed to ensure that all wash water generated during decontamination can be collected and containerized for proper disposal.

6.2 Waste Handling and Disposal

All waste materials (drill cuttings, decontamination water, etc.) generated during the Investigation will be consolidated, and stored in appropriate labeled bulk containers (drums, etc.), and temporarily staged at an investigation derived waste storage area onsite. Roux will then coordinate waste characterization and disposal by appropriate means.

TABLES

1. Preservation, Holding Times, and Sample Containers
2. Laboratory QC Summary

Table 1. Preservation, Holding Times and Sample Containers

Analysis	Matrix	Bottle Type	Preservation(a)	Holding Time(b)
TCL/SRS VOCs +10	Soil	Encore	Cool to 4°C	48 hours to extrude into methanol/DI vials, 14 days to analysis
	Soil	Terracore	Cool to 4°C	48 hours to freeze DI vials, 14 days to analysis
TCLP VOCs	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to analysis
Percent Moisture	Soil	2 oz soil jar or equivalent	Cool to 4°C	180 days to analysis
TCL/SRS SVOCs +20	Soil	8 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis
TAL Metals plus Mercury	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	TAL Metals 180 day until analysis. Mercury 28 days.
Trivalent/Hexavalent Chromium	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	30 days to extract. 7 days from extraction to analysis
PCBs	Soil	8 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis
TCL/SRS Pesticides	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis
Extractable Petroleum Hydrocarbon (NJEPH)	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis
Herbicides	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis
Total Cyanide	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis
TCLP Metals RCRA 8 Plus Mercury	Soil	8 oz wide mouth glass, teflon lined cap	Cool to 4°C	TCLP Metals 6020B/6010D = 180 days. TCLP Mercury = 28 days
TCLP SVOCs	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to leach; 7 days from leach to extraction; 40 days from extraction to analysis
TCLP Pesticides	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to leach; 7 days from leach to extraction; 40 days from extraction to analysis
TCLP Herbicides	Soil	4 oz wide mouth glass, teflon lined cap	Cool to 4°C	14 days to leach; 7 days from leach to extraction; 40 days from extraction to analysis

[a] All soil and groundwater samples to be preserved in ice during collection and transport
[b] Days from date of sample collection.
VOCs - Volatile Organic Compounds
SVOCs - Semivolatile Organic Compounds
PCBs - Polychlorinated Biphenyls
SRS - New Jersey Soil Remediation Standards
TAL - Target Analyte List
PFAS - Per- and Polyfluoroalkyl Substances
TCL - USEPA Contract Laboratory Program Target Compound List
USEPA - United States Environmental Protection Agency

Table 2. Laboratory QC Summary

QC Check Type	Minimum Frequency	Use
Laboratory QC		
Laboratory Control Sample	1 per matrix per SDG	Accuracy
Matrix Spike/Matrix Spike Duplicate/Matrix Duplicate	1 per matrix per 20 samples	Accuracy/Precision
Surrogate Spike	All organics samples	Accuracy
Laboratory Duplicate	1 per matrix per SDG	Precision
Method Blank	1 per matrix per SDG	Sensitivity

Notes:
* SDG - Sample Delivery Group - Assumes a single extraction or preparation
** Provided to lab by field sampling personnel

ATTACHMENT 1

Standard Operating Procedures

EPA 537 (PFAS) Field Sampling Guidelines

PLEASE READ INSTRUCTIONS ENTIRELY PRIOR TO SAMPLING EVENT

Sampling for PFAS via EPA 537 can be challenging due to the prevalence of these compounds in consumer products. The following guidelines are strongly recommended when conducting sampling.

Reference-NHDES https://www.des.nh.gov/organization/divisions/waste/hwrb/documents/pfc-stakeholder-notification-20161122.pdf

FIELD CLOTHING and PPE

- No clothing or boots containing Gore-Tex®
- All safety boots made from polyurethane and PVC
- No materials containing Tyvek®
- Do not use fabric softener on clothing to be worn in field
- Do not used cosmetics, moisturizers, hand cream, or other related products the morning of sampling
- Do not use unauthorized sunscreen or insect repellant (see reference above for acceptable products)

FOOD CONSIDERATIONS

No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

OTHER RECOMMENDATIONS

Sample for PFAS first! Other containers for other methods may have PFAS present on their sampling containers

SAMPLE CONTAINERS

- All sample containers made of HDPE or polypropylene
- Caps are unlined and made of HDPE or polypropylene (no Teflon® -lined caps)

WET WEATHER (AS APPLICABLE)

Wet weather gear made of polyurethane and PVC only

EQUIPMENT DECONTAMINATION

- "PFAS-free" water on-site for decontamination of sample equipment. No other water sources to be used
- Only Alconox and Liquinox can be used as decontamination materials

FIELD EQUIPMENT

- Must not contain Teflon® (aka PTFE) or LDPE materials
- All sampling materials must be made from stainless steel, HDPE, acetate, silicon, or polypropylene
- No waterproof field books can be used
- No plastic clipboards, binders, or spiral hard cover notebooks can be used
- No adhesives (i.e. Post-It® Notes) can be used
- Sharpies and permanent markers not allowed; regular ball point pens are acceptable
- Aluminum foil must not be used
- Keep PFC samples in separate cooler, away from sampling containers that may contain PFAS
- Coolers filled with regular ice only - Do not use chemical (blue) ice packs

EPA 537 (PFAS) Field Sampling Guidelines

PLEASE READ INSTRUCTIONS ENTIRELY PRIOR TO SAMPLING EVENT

Sampler must wash hands before wearing nitrile gloves in order to limit contamination during sampling. Each sample set requires a set of containers to comply with the method as indicated below. **Sample set is composed of samples collected from the same sample site and at the same time.*

Container Count	Container Type	Preservative
3 Sampling Containers - Empty	250 mL container	Pre preserved with 1.25 g Trizma
1 Reagent Water for Field Blank use	250 mL container	Pre preserved with 1.25 g Trizma
P1 Field Blank (FRB) - Empty	250 mL container	Unpreserved

Sampling container must be filled to the neck. For instructional purposes a black line has been drawn to illustrate the required fill level for each of the 3 Sample containers

Field blanks are recommended and the containers have been provided, please follow the instructions below.

Field Blank Instructions:

1. Locate the Reagent Water container from the bottle order. The Reagent Water container will be pre-filled with PFAS-free water and is preserved with Trizma.
2. Locate the empty container labeled "Field Blank".
3. Open both containers and proceed to transfer contents of the "Reagent Water" container into the "Field Blank" container.
4. If field blanks are to be analyzed, they need to be noted on COC, and will be billed accordingly as a sample.

Both the empty Reagent Water container and the filled Field Blank container must be returned to the lab along with the samples taken.

Sampling Instructions:

1. Each sampling event requires 3 containers to be filled to the neck of the provided containers for each sampling location.
2. Before sampling, remove faucet aerator, run water for 5 min, slow water to flow of pencil to avoid splashing and fill sample containers to neck of container (as previously illustrated) and invert 5 times.
3. Do not overfill or rinse the container.
4. Close containers securely. Place containers in sealed ZipLoc® bags, and in a separate cooler (no other container types).
5. Ensure Chain-of-Custody and all labels on containers contain required information. Place sample, Field Blank and empty Reagent Blank containers in ice filled cooler (do not use blue ice) and return to the laboratory. Samples should be kept at 4°C ±2. Samples must not exceed 10°C during first 48 hours after collection. Hold time is 14 days.

Please contact your Alpha Analytical project manager with additional questions or concerns.

Date: May 5, 2000
Revision: April 16, 2015

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sample handling and management which will allow consistent and accurate results. Valid chemistry data are integral to investigations that characterize media-quality conditions. This SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner which will maintain sample integrity. The procedures outlined are applicable to most sampling events and any required modifications must be clearly described in the work plan.

2.0 CONSIDERATIONS

Sample containers, sampling equipment decontamination, quality assurance/quality control (QA/QC), sample preservation, and sample handling are all components of this SOP.

2.1 Sample Containers

Prior to collection of a sample, considerations must be given to the type of container that will be used to store and transport the sample. The type and number of containers selected is usually based on factors such as sample matrix, potential contaminants to be encountered, analytical methods requested, and the laboratory's internal quality assurance requirements. In most cases, the overriding considerations will be the analytical methodology, or the state or federal regulatory requirements because these regulations generally encompass the other factors. The sample container selected is usually based on some combination of the following criteria:

a. Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample.

In some instances, however, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of the glass containers in an aqueous matrix, plastic bottles (e.g., nalgene) must be used for samples collected for metals analysis. A separate, plastic container should accompany glass containers if metals analysis is to be performed along with other analyses. Likewise, other sample

characteristics may dictate that glass cannot be used. For example, in the case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the container's surface.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analysis being performed and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual laboratories may provide larger volume containers for various analytes to ensure sufficient quantities for duplicates or other QC checks.

To facilitate transfer of the sample from the sampler into the container and to minimize spillage and sample disturbance, wide-mouth containers are recommended when not precluded by method requirements. Aqueous volatile organic samples must be placed into 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., TeflonTM) septums. Non-aqueous volatile organic samples for "low-level" volatile analysis should be collected in the same type of vials or using EnCore samplers provided by the laboratory. Non-aqueous volatile organic samples for "mid or high-level" volatile analysis may be collected in 4-ounce (oz) wide-mouth jars provided by the laboratory. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, then containers holding samples should be protected from light (i.e., place in cooler with ice immediately after filling).

d. Container Closures

Container closures must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample, and the container cap must be replaced (securely) immediately after filling it. Closures should be constructed of a material which is inert with respect to the sampled material, such as PTFE (e.g., TeflonTM). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE sheeting. If soil or sediment samples are being collected, the threads of the container must be wiped clean with a dedicated paper towel or cloth so the cap can be threaded properly.

e. Decontamination of Sample Containers

Sample containers must be laboratory cleaned by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample. Sample containers must be carefully examined to ensure that all containers appear clean. Do not mistake the preservative as unwanted residue. The bottles should not be field cleaned. If there is any question regarding the integrity of the bottle, then the laboratory must be contacted immediately and the bottle(s) replaced.

f. Sample Bottle Storage and Transport

No matter where the sample bottles are, whether at the laboratory waiting to be packed for shipment or in the field waiting to be filled with sample, care must be taken to avoid contamination. Sample shuttles or coolers, and sample bottles must be stored and transported in clean environments. Sample bottles and clean sampling equipment must never be stored near solvents, gasoline, or other equipment that is a potential source of cross-contamination. When under chain of custody, sample bottles must be secured in locked vehicles, and custody sealed in shuttles or in the presence of authorized personnel. Information which documents that proper storage and transport procedures have been followed must be included in the field notebook and on appropriate field forms.

2.2 Decontamination of Sampling Equipment

Proper decontamination of all re-usable sampling equipment is critical for all sampling episodes. The SOP for Decontamination of Field Equipment and SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for decontamination of various types of equipment.

2.3 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and tracking of environmental measurements, and subsequent review, interpretation and validation of generated analytical data. The SOPs for Collection of Quality Control Samples, for Evaluation and Validation of Data, and for Field Record Keeping and Quality Assurance/Quality Control must be referred to for detailed guidance regarding these respective procedures. SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for QA/QC procedures.

2.4 Sample Preservation Requirements

Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Generally, this is accomplished under the following two scenarios:

a. Sample bottles are preserved at the laboratory prior to shipment into the field.

b. Preservatives are added in the field immediately after the samples are collected.

Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample could be collected, resulting in too much preservative in the sample. More commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles. The use of pre-preserved bottles is acceptable; however, field sampling teams must always be prepared to add additional preservatives to samples if the aforementioned situations occur. Furthermore, care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling and therefore diluting the preservative (i.e., not having enough preservative for the volume of sample).

When samples are preserved after collection, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher-grade.

2.5 Sample Handling

After the proper sample bottles have been received under chain-of-custody, properly decontaminated equipment has been used to collect the sample, and appropriate preservatives have been added to maintain sample integrity, the final step for the field personnel is checking the sample bottles prior to proper packing and delivery of the samples to the laboratory.

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness and any 40-ml volatile organic compound (VOC) bottles must be checked for bubbles. This can be achieved by gently tapping the bottom of the voa to dislodge potential air bubbles. Each sample bottle must be placed in an individual "zip-lock" bag to protect the label, and placed on ice. Clear packing tape may also be used to protect the integrity of the sample label. The bottles must be carefully packed to prevent breakage during transport. Use of bubble wrap is recommended. When several bottles have been collected for an individual sample, they should not be placed adjacent to each other in the cooler to prevent possible breakage of all bottles for a given sample. If there are any samples which are known or suspected to be highly contaminated, these should be placed in an individual cooler under separate chain-of-custody to prevent possible cross contamination. Sufficient ice (wet or blue packs) should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery at the laboratory.

Consult the work plan to determine if a particular ice is specified as the preservation for transportation (e.g., the United States Environmental Protection

Agency does not like the use of blue packs because they claim that the samples will not hold at 4°C). If additional coolers are required, then they should be purchased.

The chain-of-custody form should be properly completed, placed in a "zip-lock" bag, and placed in the cooler. One copy must be maintained for the project files. The cooler should be sealed with packing tape and a custody seal. The custody seal number should be noted in the field book. Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time. If overnight mail is utilized, then the shipping bill must be maintained for the files and the laboratory must be called the following day to confirm receipt.

3.0 EQUIPMENT AND MATERIALS

3.1 General equipment and materials may include, but not necessarily be limited to, the following:

a. Sample bottles of proper size and type with labels.

b. Cooler with ice (wet or blue pack).

c. Field notebook, appropriate field form(s), chain-of-custody form(s), custody seals.

d. Black pen and indelible marker.

e. Packing tape, "bubble wrap", and "zip-lock" bags.

f. Overnight (express) mail forms, and laboratory addres or courier contact information

g. Health and safety plan (HASP).

h. Work plan/scope of work.

i. Pertinent SOPs for specified tasks and their respective equipment and materials.

3.2 Preservatives for specific samples/analytes as specified by the laboratory. Preservatives must be stored in secure, spillproof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous equipment and materials including, but not necessarily limited to, the following:

a. Graduated pipettes.

b. Pipette bulbs.

c. Litmus paper.

d. Glass stirring rods.

e. Protective goggles.

f. Disposable gloves.

g. Lab apron.

h. First aid kit.

i. Portable eye wash station.

j. Water supply for immediate flushing of spillage, if appropriate.

k. Shovel and container for immediate containerization of spillage-impacted soils, if appropriate.

4.0 PROCEDURE

4.1 Examine all bottles and verify that they are clean and of the proper type, number, and volume for the sampling to be conducted.

4.2 Label bottles carefully and clearly with project name and number, site location, sample identification, date, time, and the sampler's initials using an indelible marker.

4.3 Collect samples in the proper manner (refer to specific sampling SOPs).

4.4 Conduct preservation activities as required after each sample has been collected. Field preservation must be done immediately and must not be done later than 30 minutes after sample collection.

4.5 Conduct QC sampling, as required.

4.6 Seal each container carefully and place in an individual "zip lock" bag.

4.7 Organize and carefully pack all samples in the cooler immediately after collection (e.g., bubble wrap). Insulate samples so that breakage will not occur.

4.8 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment or delivery to the laboratory, it may be easier to tape the chain-of-custody to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody as a courtesy to the laboratory personnel.

4.9 Add additional ice as necessary to ensure that it will last until receipt by the laboratory.

4.10 Seal the cooler with packing tape and a custody seal. Record the number of the custody seal in the field notebook and on the field form. If there are any exceptionally hazardous samples, then shipping regulations should be examined to ensure that the sample containers and coolers are in compliance and properly labeled.

4.11 Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time.

4.12 Maintain the shipping bill for the project files if overnight mail is utilized and call the laboratory the following day to confirm receipt.

END OF PROCEDURE

Date: January 9, 2011
Revision: May 12, 2015

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidelines for the collection of soil samples for laboratory analysis. This SOP is applicable to soil samples collected from split-spoon, Geoprobe™ core samples, and Sonic core samplers during drilling, hand auger samples, grab samples from stockpiled soils, surface samples, test pit samples, etc.

2.0 CONSIDERATIONS

Soil samples may be collected in either a random or biased manner. Random samples can be based on a grid system or statistical methodology. Biased samples can be collected in areas of visible impact or suspected source areas. Soil samples can be collected at the surface, shallow subsurface, or at depth. When samples are collected at depth, the water content should be noted, since generally "soil sampling" is restricted to the unsaturated zone. Equipment selection will be determined by the depth of the sample to be collected. A thorough description of the sampling locations and proposed methods of sample collection should be included in the work plan.

Commonly, surface sampling refers to the collection of samples at a 0 to 6 inch depth interval. Certain regulatory agencies may define the depth interval of a surface sample differently, and this must be defined in the work plan. Collection of surface soil samples is most efficiently accomplished with the use of a stainless steel trowel or scoop. For samples at greater depths, a Geoprobe™ or other direct push sampling method, or a decontaminated bucket auger or power auger may be needed to advance the hole to the point of sample collection. If augering to depth, once the sampling depth is reached a clean bucket auger should be used to collect the sample. To collect samples at depths of greater than approximately six feet, the use of a drill rig (direct push, split spoon, etc) will usually be necessary. In some situations, such as an excavation or trench, sample locations are accessed with the use of a backhoe.

3.0 EQUIPMENT AND MATERIALS

a. Safety first. Obtain the appropriate Job Safety Analysis (JSA) and personal protection equipment (PPE), as specified in the site Health and Safety Plan (HASP).

b. A work plan which outlines soil sampling requirements.

c. Field notebook, field form(s), maps, chain-of-custody forms, and custody seals.

d. Decontamination supplies (including: non-phosphate laboratory grade detergent, buckets, brushes, potable water, distilled water, plastic sheeting, etc.).

e. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

f. Stainless steel spoons or spatulas.

g. Disposable Nitrile sampling gloves and cut-proof gloves.

h. Laboratory-supplied sample containers with labels.

i. Cooler with blue or wet ice.

j. Plastic sheeting.

k. Black pen and indelible marker.

l. Zip-lock bags and packing material.

m. Tape measure.

n. Paper towels or clean rags.

o. Masking and packing tape.

p. Overnight (express) mail forms or schedule courier pickup.

4.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP (ROUX SOP 9.1). Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves and plastic sheeting will be changed after each use and discarded in an appropriate manner.

5.0 PROCEDURE

5.1 Prior to collecting soil samples, ensure that all sampling equipment has been thoroughly cleaned according to the ROUX SOP 9.1 decontamination procedures. If samples are to be collected at depth, then the boring must be advanced with thoroughly cleaned equipment to the desired sampling horizon and a different thoroughly cleaned sampler must be used to collect the sample.

5.2 Using disposable gloves and a pre-cleaned, stainless steel spatula or spoon, extract the soil sample from the sampler, measure the recovery, and separate the wash from the true sample. Where allowed by regulatory agency(ies), disposable plastic spoons may be used. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised

When sampling shallow soils, if a thick, matted root zone, gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials.

When using direct push sampling methods, it is important to maintain the proper orientation of the sample when the sampling liners are removed from the sample tubes define precisely the depth at which an aliquot was collected. This is particularly important when multiple sample depths are collected from the same push.

When utilizing a split spoon sampling method, always discard the top several inches of material in the spoon before removing any portion for sampling. This material normally consists of borehole wall material that has sloughed off of the boregole wall after removal of the drill string prior to inserting the split spoon.

When utilizing a backhoe to collect soil samples from a trench or excavation, measures should be taken to ensure that the bucket is decontaminated and that no paint, grease, and rust is present prior to sample collection.

5.3 Place the sample in a laboratory-supplied, pre-cleaned sample container. Cut-proof gloves should be worn at all times when handling glassware. This should be done as quickly as possible and this is especially important when sampling for volatile organic compounds (VOCs). Samples to be analyzed for VOCs must be collected prior to other constituents.

If samples are to be analyzed for VOCs, they should be collected in a manner that minimizes disturbance of the sample. ***Samples for VOC analysis must not be homogenized.***

5.4 The sample container will be labeled with appropriate information such as, client name, site location, sample identification (location, depth, etc.), date and time of collection, and sampler's initials.

5.5 Using the remaining portion of soil from the sampler, log the sample in detail and record physical characteristics (color, odor, moisture, texture, density, consistency, organic content, layering, grain size, etc.). Refer to Soil Classification and logging SOP.

5.6 If soil samples are to be composited in the field, then equal portions from selected locations will be placed on a clean plastic sheet or in a Zip-lock bag and homogenized. make sure that each composite location (aliquot) consist of equal volumes,(i.e., same number of equal spoonfuls). Alternately, several samples may be submitted to the laboratory for compositing by weight. The method used is dependent upon regulatory requirements. Specific compositing procedures shall be approved by the appropriate regulatory agency and described in the work

plan. Samples to be analyzed for VOCs will not be composited unless required by a regulatory agency.

5.7 After the sample has been collected, labeled, and logged in detail, it is placed in a zip-lock bag and stored in a cooler with ice, at 4°C. Store the sample cooler in a secure location.

5.8 A chain-of-custody form is completed for all samples collected. One copy is retained and two are sent with the samples in a Zip-lock bag to the laboratory. A signed and dated custody seal is placed on the cooler prior to shipment.

5.9 Samples collected from Monday to Friday are typically to be delivered to the laboratory within 24 hours of collection. If Saturday delivery is unavailable, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if any analytes require a shorter delivery time.

5.10 The field notebook and appropriate forms should include, but not be limited to, the following: client name, site location, sample location, sample depth, sample identification, sample date and time collected, sampler's name, method of sample collection, number and type of containers, geologic description of material, description of decontamination procedures, etc. A site map should be prepared with exact measurements to each sample location in case follow-up sampling is necessary.

5.11 All reusable sampling equipment must be thoroughly cleaned in accordance with the ROUX SOP 9.1 decontamination procedures. Following the final decontamination (after all samples are collected), the sampling equipment is wrapped with plastic. Discard any gloves, plastic, etc. in an appropriate manner that is consistent with site conditions.

END OF PROCEDURE

Date: January 10, 2011
Revision: May 12, 2015

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for screening soil samples for volatile organic vapors using a portable photoionization detector (PID). This SOP is applicable to soil samples collected from split-spoon, Geoprobe™ macro-core, Sonic cores and Shelby tube samplers during drilling, hand auger samples, and grab samples from stockpiled soils.

2.0 CONSIDERATIONS

The primary objective of photoionization screening of soil samples is to obtain a qualitative understanding of the distribution of volatile organic compounds (VOCs) in soil. The proper design of an organic vapor screening program requires an understanding of site hydrogeology, potential source areas, and potential constituents of concern. Sample locations and frequency must be fully defined in the work plan. The work plan should outline the type of lamp to be utilized in the PID based on the ionization potentials and response factors of the constituents of concern. The work plan must also clearly describe the heating or equilibration procedures to be employed if they differ from those described in this SOP. Regardless of the specific equilibration procedure employed, it is imperative that each sample be treated identically to allow the photoionization results from different locations to be compared. Observations such as water, clay, and organic content should be noted to facilitate interpretation of the data. Every effort should be made to collect a representative portion of soil from the sampling device.

3.0 EQUIPMENT AND MATERIALS

a. Safety first. Obtain the appropriate Job Safety Analysis (JSA) and personal protection equipment (PPE), as specified in the site Health and Safety Plan (HASP).

b. A work plan which outlines photoionization screening requirements.

c. Decontamination supplies (including: non-phosphate laboratory grade detergent, buckets, brushes, potable water, distilled water, plastic sheeting, etc.).

d. Field notebook, field form(s), maps, chain-of-custody forms.

e. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

f. Stainless steel spoons or spatulas.

g. Disposable plastic spoons.

h. Plastic sheeting.

i. Gallon size Zip-lock bags.

j. Photoionization detector (PID) with charging unit.

k. Calibration gases with regulator.

l. Indelible marker.

m. Masking tape.

n. Disposable Nitrile sampling gloves.

4.0 DECONTAMINATION

Where possible, thoroughly pre-cleaned and wrapped sampling equipment must be used and dedicated to individual sampling locations. Disposable items such as sampling gloves, aluminum foil, and sample jars will be changed after each use and discarded in an appropriate manner. If only photoionization results are to be obtained, then split-spoon samples and hand augers may be cleaned with a non-phosphate laboratory grade detergent and water wash and potable water rinse or steam cleaning, and a final distilled water rinse. However, if samples are to be collected concurrently for laboratory analytical results, then all reusable sampling equipment must be thoroughly decontaminated according to the ROUX SOP 9.1 for decontamination of field equipment.

5.0 CALIBRATION

5.1 The PID must be calibrated according to the manufacturer's specifications at a minimum frequency of once per day prior to collecting photoionization readings. In addition, periodic checks (e.g., every 2 hours or every ten samples) with the standard gas will be conducted to confirm that the calibration has not drifted.

5.2 The time, date, and calibration procedure must be clearly documented in the field notebook and the calibration log.

5.3 If at any time the photoionization results appear erratic or inconsistent with field observations, then the unit must be recalibrated. If calibration is difficult to achieve, then the unit's lamp should be checked for dirt or moisture and cleaned, as necessary. During humid or wet conditions, the unit should be calibrated on a more frequent basis as determined by field personnel.

6.0 PROCEDURE

6.1 Allow the temperature of the unit to equilibrate to its surrounding. This should take about five minutes.

6.2 Extract the soil sample from the sampler, quickly measure the recovery, and separate the wash from the true sample by using a dedicated, stainless steel spatula. Where allowed by regulatory agency(ies), disposable plastic spoons may be used.

6.2 Place the sample in a 1-Gallon Zip-lock bag (as quickly as possible to avoid loss of VOCs) filling the bag half full, if possible. Seal the bag and ensure an adequate seal has been created by pressing on the bag and observing if air discharges from the bag.

6.3 Label the bag with the boring/ID number, depth of sample, date of collection and sampler's initials. In addition, the field personnel will ensure the following: samples are taken at appropriate depths; unrepresentative portions of the sample are discarded properly; that the soil sampler (i.e., split spoon) is decontaminated properly between use; and the driller uses proper methods during sample collection and does not use oil or grease on tools entering the borehole.

6.4 Log the sample in detail and record physical characteristics (color, odor, moisture, texture, density, consistency, organic content, and layering). Refer to ROUX SOP 5.5 for soil classification and logging procedures.

6.5 Ensure that the PID has been calibrated and that the calibration information is documented in the field book. Pierce the Zip-lock bag with the probe from the PID and measure the relative concentration of VOCs in the headspace of the soil sample. The initial (peak) reading must be recorded.

6.6 Record the PID reading in the field notebook, on an appropriate field form, and on the base map, if appropriate. All readings should be recorded in parts per million (ppm).

6.7 Dispose of any soil/geologic material/cutting in a designated waste storage container (e.g. drum) consistent with site disposal requirements.

6.8 If only field screening results are to be obtained, then reusable sampling devices may be cleaned with a non-phosphate laboratory grade detergent and water wash and a potable water rinse. The sampler will then be rinsed with distilled water, assembled and placed on plastic sheeting for reuse. A more rigorous decontamination procedure is required when samples are also being collected for laboratory analysis. Refer to the SOP for collection of soil samples for laboratory analysis for additional information.

END OF PROCEDURE

Date: January 9, 2011
Revision: May 5, 2015

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for decontamination of all field equipment potentially exposed to contamination during field investigation activities (i.e. drilling, soil and water sampling).

The objective of decontamination is to ensure that all field samplingequipment is decontaminated (free of potential contaminants): 1) prior to being brought onsite to avoid the introduction of potential contaminants to the site; 2) between drilling and sampling events/activities onsite to eliminate the potential for cross-contamination between boreholes and/or wells; and 3) prior to the removal of equipment from the site to prevent the transportation of potentially contaminated equipment offsite.

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC).

In considering decontamination procedures, state and federal regulatory agency requirements must be considered because of potential variability between state and federal requirements. Decontamination procedures must be in compliance with state and/or federal protocols in order that regulatory agency(ies) scrutiny of the procedures and data collected do not result in non acceptance (invalidation) of the work undertaken and data collected.

The equipment and materials list for decontamination activities may include, but not necessarily be limited to, the following:

a. A work plan and health and safety plan which outlines decontamination procedures and requirements.

b. Field notebook and field form(s).

c. Decontamination solutions, including as necessary: non-phosphate, laboratory-grade detergent; distilled/deionized water; potable water; cleaning solvents if needed [e.g., hexane, acetone, nitric acid).

d. Long and short handled brushes,

e. Bottle brushes

f. Drop cloth/plastic sheeting

g. Paper towels

h. Plastic or galvanized tubs or buckets

i. Pressure washers or steam cleaners

j. Solvent sprayers

k. Trash / bilge pumps

l. Aluminum foil

m. 55-gallon drums.

2.0 PROCEDURE FOR DRILLING EQUIPMENT

The following is a minimum decontamination procedure for drilling equipment. Drilling equipment decontamination procedures will be documented on an appropriate field form or in the field notebook, especially any variation from the method itemized below:

2.1 Safety first. Obtain the appropriate Job Safety Analysis (JSA) and personal protection equipment (PPE), as specified in the site Health and Safety Plan (HASP). Prior to mobilization to a site, the expected types of contamination should be evaluated to determine if the field cleaning and decontamination activities will generate rinsates and other waste waters that might be considered RCRA hazardous waste or may require special handling.

2.2 The drill rig and all associated equipment should be properly decontaminated by the contractor before arriving at the site.

2.3 The augers, drilling casings, rods, samplers, tools, and any piece of equipment that can come in contact (directly or indirectly) with the soil, requires proper decontamination on-site prior to commencing drilling. The project work plan or HASP, and appropriate regulatory requirements, should be consulted to determine site-specific decontamination requirements.

2.4 The same decontamination procedures used prior to drilling will be followed between boreholes (at a fixed on-site location[s], if appropriate) and before leaving the site at the end of the investigation.

2.5 All on-site steam cleaning or (decontamination) activities will be monitored and documented by a member(s) of the staff of Roux Associates, Inc. and should be performed on a decontamination pad that meets the following specifications:

1. The pad should be constructed in an area known or believed to be free of surface contamination.
2. A temporary pad should be lined with a water impermeable material with no seams within the pad. This material should be either easily replaced disposable) or repairable.The pad should be regularly inspected to ensure there are no leaks.

3. Water should be removed from the decontamination pad frequently.

2.6 If drilling activities are conducted in the presence of thick, sticky oils (e.g., PCB oil) which coat drilling equipment, then special decontamination procedures may have to be utilized before steam cleaning (e.g., hexane scrub and wash).

2.7 Containment of decontamination fluids may be necessary (e.g., rinseate from steam cleaning) or will be required (e.g., hexane), and disposal must be in accordance with state and/or federalregulatory requirements.

3.0 PROCEDURE FOR SOIL-SAMPLING EQUIPMENT

The following is a minimum decontamination procedure for soil-sampling equipment (e.g., split spoons, stainless-steel spatulas). Soil-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

3.1 Safety first. Obtain JSA and PPE, as specified in the site HASP.

3.2 Wear disposable gloves while cleaning equipment to avoid cross-contamination and change gloves as needed.

3.3 Steam clean the sampler or rinse with potable water. If soil-sampling activities are conducted in the presence of thick, sticky oils (e.g., PCB oil) which coat sampling equipment, then special decontamination procedures may have to be utilized before steam cleaning and washing in detergent solution (e.g., hexane scrub and wash).

3.4 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or potable water in a clean bucket.

3.5 Disassemble the sampler, as necessary and immerse all parts and other sampling equipment in the solution.

3.6 Scrub all equipment in the bucket with a brush to remove any adhering particles.

3.7 Rinse all equipment with copious amounts of potable water followed by distilled or deionized water.

3.8 Place clean equipment on a clean plastic sheet (e.g., polyethylene)

3.9 Reassemble the cleaned sampler, as necessary.

3.10 After equipment has been cleaned, all individuals involved in equipment handling should don clean gloves, or wrap the equipment with a suitable material (e.g., plastic bag, aluminum foil).

As part of the decontamination procedure for soil-sampling equipment, state and/or federal protocols must be considered. These may require procedures above

those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

4.0 PROCEDURE FOR WATER-SAMPLING EQUIPMENT

The following is a decontamination procedure for water-sampling equipment (e.g., bailers, pumps). Water-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

4.1 Safety first. Obtain the JSAs and PPE, as specified in the site HASP.

4.2 Decontamination procedures for bailers follow:

a. Wear disposable gloves while cleaning bailer to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a bucket.

c. Disassemble sampling equipment. Discard all used sampling tubes and cords in an appropriate manner. Disconnect all power sources from electrical equipment (i.e. pumps). Scrub each piece of equipment with a brush and solution.

d. Rinse all sampling equipment with copious amounts of potable, distilled or deionized water, Reassemble equipment as per the manufacturer's instructions.

f. Air dry.

g. Wrap equipment with a suitable material (e.g., clean plastic bag, aluminum foil).

4.3 Decontamination procedures for pumps follow:

a. Wear disposable gloves while cleaning pump to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a clean bucket, clean garbage can, or clean 55-gallon drum.

c. Flush the pump and discharge hose (if not disposable) with the detergent solution, and discard disposable tubing and/or cord in an appropriate manner.

d. Flush the pump and discharge hose (if not disposable) with potable water.

e. Place the pump on clear plastic sheeting.

f. Wipe any pump-related equipment (e.g., electrical lines, cables, discharge hose) that entered the well with a clean cloth and detergent solution, and rinse or wipe with a clean cloth and potable water.

g. Air dry.

h. Wrap equipment with a suitable material (e.g., clean plastic bag).

As part of the decontamination procedure for water-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

END OF PROCEDURE

June 2019

Sampling for 1,4-Dioxane and Per- and Polyfluoroalkyl Substances (PFAS) Under DEC's Part 375 Remedial Programs

Objective

The Department of Environmental Conservation (DEC) is requiring sampling of all environmental media and subsequent analysis for the emerging contaminants 1,4-Dioxane and PFAS as part of all remedial programs implemented under 6 NYCRR Part 375, as further described in the guidance below.

Sample Planning

The number of samples required for emerging contaminant analyses is to be the same number of samples where "full TAL/TCL sampling" would typically be required in an investigation or remedial action compliance program.

Sampling of all media for ECs is required at all sites coming into or already in an investigative phase of any DER program. In other words, if the sampling outlined in the guidance hasn't already been done or isn't part of an existing work plan to be sampled for in the future, it will be necessary to go back out and perform the sampling prior to approving a SC report or issuing a decision document.

PFAS and 1,4-dioxane shall be incorporated into the investigation of potentially affected media, including soil, groundwater, surface water, and sediment as an addition to the standard "full TAL/TCL sampling." Biota sampling may be necessary based upon the potential for biota to be affected as determined pursuant to a Fish and Wildlife Impact analysis. Soil vapor sampling for PFAS and 1,4-dioxane is not required.

Upon an emerging contaminant being identified as a contaminant of concern (COC) for a site, those compounds must be assessed as part of the remedy selection process in accordance with Part 375 and DER-10 and included as part of the monitoring program upon entering the site management phase.

Special Testing Requirements for Import or Reuse of Soil: Soil imported to a site for use in a soil cap, soil cover, or as backfill must be tested for 1,4-dioxane and PFAS contamination in general conformance with DER-10, Section 5.4(e). Soil samples must be analyzed for 1,4-dioxane using EPA Method 8270, as well as the full list of PFAS compounds (currently 21) using EPA Method 537.1 (modified).

For 1,4-dioxane, soil exceeding the Unrestricted SCO of 0.1 ppm must be rejected per DER 10: Appendix 5 - Allowable Constituent Levels for Imported Fill or Soil, Subdivision 5.4(e).

If PFOA or PFOS is detected in any sample at or above 1 ppb, then a soil sample must be tested by the Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed. If the SPLP results exceed 70 ppt combined PFOA/S, then the source of backfill must be rejected. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays.

The work plan should explicitly describe analysis and reporting requirements, including laboratory analytical procedures for modified methods discussed below.

Analysis and Reporting

Labs should provide a full category B deliverable, and a DUSR should be prepared by an independent 3rd party data validator. QA/QC samples should be collected as required in DER-10, Section 2.3(c). The electronic data submission should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

PFAS analysis and reporting: DEC has developed a *PFAS Analyte List* (below) for remedial programs. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any compounds, the DEC project manager, in consultation with the DEC remedial program chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site.

Currently, ELAP does not offer certification for PFAS compounds in matrices other than finished drinking water. However, laboratories analyzing environmental samples (e.g., soil, sediments, and groundwater) are required by DER to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537 or ISO 25101. Labs must also adhere to the requirements and criteria set forth in the Laboratory Guidance for Analysis of PFAS in Non-Potable Water and Solids.

Modified EPA Method 537 is the preferred method to use for environmental samples due to its ability to achieve very low detection limits. Reporting limits for PFAS in groundwater and soil are to be 2 ng/L (ppt) and 1 ug/kg (ppb), respectively. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve these reporting limits for the entire list of 21 PFAS, site-specific decisions will need to be made by the DEC project manager in consultation with the DEC remedial program chemist. Note: Reporting limits for PFOA and PFOS in groundwater should not exceed 2 ng/L.

Additional laboratory methods for analysis of PFAS may be warranted at a site. These methods include Synthetic Precipitation Leaching Procedure (SPLP) by EPA Method 1312 and Total Oxidizable Precursor Assay (TOP Assay).

SPLP is a technique for determining the potential for chemicals in soil to leach to groundwater and may be helpful in determining the need for addressing PFAS-containing soils or other solid material as part of the remedy. SPLP sampling need not be considered if there are no elevated PFAS levels in groundwater. If elevated levels of PFAS are detected in water, and PFAS are also seen in soil, then an SPLP test should be considered to better understand the relationship between the PFAS in the two media.

The TOP Assay can assist in determining the potential PFAS risk at a site. For example, some polyfluoroalkyl substances may transform to form perfluoroalkyl substances, resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from the site. To conceptualize the amount and type of oxidizable perfluoroalkyl substances which could be liberated in the environment, a “TOP Assay” analysis can be performed, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized.

PFAS-containing materials can be made up of per- and polyfluoroalkyl substances that are not analyzable by routine analytical methodology (LC-MS/MS). The TOP assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by current

analytical methodology. Please note that analysis of highly contaminated samples, such as those from an AFFF site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances. Please consult with a DEC remedial program chemist for assistance interpreting the results.

1,4-Dioxane analysis and reporting: The reporting limit for 1,4-dioxane in groundwater should be no higher than 0.35 µg/L (ppb) and no higher than 0.1 mg/kg (ppm) in soil. Although ELAP offers certification for both EPA Method 8260 and EPA Method 8270 for 1,4-dioxane, DER is advising the use of Method 8270 SIM for water samples and EPA Method 8270 for soil samples. EPA Method 8270 SIM is not necessary for soils if the lab can achieve the required reporting limits without the use of SIM. Note: 1,4-dioxane is currently listed as a VOC in the Part 375 SCO tables but will be moved to the SVOC table with the next update to Part 375.

Refinement of sample analyses: As with other contaminants that are analyzed for at a site, the emerging contaminant analyte list may be refined for future sampling events based on investigative findings. Initially, however, sampling using this PFAS Analyte List and 1,4-dioxane is needed to understand the nature of contamination.

PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

APPENDIX F

Health and Safety Plan

Site-Specific Health and Safety Plan

Former Mugler Shoring Inc.
2401 Third Avenue
Bronx, New York 10451

August 14, 2020

Prepared for:

BOP 2401 Third Avenue, LLC
Brookfield Place
250 Vesey Street
15th Floor
New York, New York 10281

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

3171.0001Y104R/CV

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Site-Specific Emergency Information

Emergency Phone Numbers

Most emergency services can be obtained by calling **911**. Where 911 service is not available, use the telephone numbers provided in the below table. The following is a master emergency phone list for use by the project management personnel. A more condensed version of the emergency numbers listed below will be posted throughout project work areas. Emergencies encountered on the site will be responded to by a combination of offsite emergency services and site personnel.

EMERGENCY CONTACT INFORMATION			
Roux Site Personnel			
Title	**Contact**		**Telephone**
Project Manager (PM)	Lauren Dolginko		(631) 630-2415; (631) 697-2773
Site Health and Safety Officer/ Site Supervisor (SHSO/SS)	TBD when field work scheduled		TBD
SHSO/SS Alternate	TBD when field work scheduled		TBD
Outside Assistance			
Agency	**Contact**	**Telephone**	**Address/Location**
Ambulance/EMS	FDNY	(718) 665-1832	234 E 149th St Bronx, NY 10451
Police	NYPD (28th Pct)	(212) 678-1611	2271-89 Frederick Douglass Blvd New York, NY 10027
Fire	FDNY (Squad 41)	(347) 272-5083	330 E 150th St Bronx, NY 10451

For location of the emergency response meeting area, see Figure 2.

For directions to Lincoln Medical Center, see Figure 3.

For directions to AFC Urgent Care, see Figure 3.

Emergency Medical Facilities

Hospital

Lincoln Medical Center
234 E 149th St, Bronx, NY 10451

Hospital Phone #: (718) 579-5000

- Head northwest toward E 135th St
- Turn right on E 135th St
- Turn left onto Lincoln Ave
- Continue straight to Third Ave
- Continue onto Morris Ave
- Turn Left

Hospital entrance will be on the right.

Urgent Care Facility

AFC Urgent Care Bronx 149th
332 E 149th St, Bronx, NY 10451

Urgent Care Phone #: (347) 751-6740

- Head northwest toward E 135th St
- Turn right onto E 135th St
- Turn left onto Lincoln Ave
- Continue straight onto Third Ave
- Continue onto Morris Ave
- Turn right onto E 149th St

Urgent Care facility will be on the right.

1. Introduction

This site-specific Health and Safety Plan (HASP) has been prepared by Roux Environmental Engineering and Geology, D.P.C. (Roux) for use by personnel from Roux (and any of Roux subcontractors) during the Remedial Investigation and any onsite work thereafter that will be performed at the Former Mugler Shoring Inc. site, located at 2401 Third Avenue, Bronx, NY (Site) (Figure 1). These activities fall within the scope of operations covered by the Occupational Safety and Health Administration (OSHA) standards promulgated at 29 CFR 1910.120 and 29 CFR 1926.65, both commonly referred to as the Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard. In accordance with the HAZWOPER Standard, this Site-specific HASP was prepared to address the safety and health hazards associated with the investigative sampling and drilling activities being performed at the Site by Roux and to provide requirements and procedures for the protection of Roux employees, subcontractor personnel, government oversight personnel, Site personnel, and the general public. It also addresses client- and Site-specific requirements for health and safety.

Implementation of this HASP is the joint responsibility of the project manager, the site health and safety officer, and all field staff, with assistance from the project principal and the office health and safety manager. The project manager for this project is Lauren Dolginko. Based on the scope of work, the field oversight personnel will act as both the Site Health and Safety Officer (SHSO) as well as Site Supervisor (SS). If necessary, an alternate SHSO/SS will be identified during the project as needed.

1.1 Roles and Responsibilities

Overall Roles and Responsibilities (R&Rs) of Roux personnel are provided in Roux's Policies and Procedures Manual. Only those R&Rs specific to HASP requirements are listed below.

Project Manager (PM)

The PM has responsibility and authority to direct all work operations. The PM coordinates safety and health functions with the SHSO, has the authority to oversee and monitor the performance of the SHSO, and bears ultimate responsibility for the proper implementation of this HASP. The specific duties of the PM are:

- Coordinating the Site work plan;
- Providing Site supervisor(s) with work assignments and overseeing their performance;
- Coordinating safety and health efforts with the SHSO;
- Ensuring effective emergency response through coordination with the Emergency Response Coordinator (ERC);
- Serving as primary Site liaison with public agencies and officials and Site contractors; and
- Exercising "stop work authority" when an imminent hazard or potentially dangerous work practice is identified or discovered.

Site Health and Safety Officer (SHSO) / Site Supervisor (SS)

The SHSO/SS has full responsibility and authority to develop and implement this HASP and to verify compliance. The SHSO/SS reports to the PM. The SHSO/SS is onsite or readily accessible at the Site during all work operations and has the authority to halt Site work if unsafe conditions are detected. The specific responsibilities of the SHSO include:

- Managing the safety and health functions on this Site;

- Executing the work plan and schedule as detailed by the PM;
- Serving as the Site's point of contact for safety and health matters;
- Ensuring Site monitoring, worker training, and effective selection as well as use of Personal Protective Equipment (PPE);
- Assessing Site conditions for unsafe acts and conditions and providing corrective action;
- Assisting the preparation and review of this HASP;
- Maintaining effective safety and health records as described in this HASP;
- Exercising "stop work authority" when an imminent hazard or potentially dangerous work practice is identified or discovered;
- Coordinating with others as necessary for safety and health efforts; and
- Acting on the recommendations of the Corporate Health & Safety Manager.

Site Workers (Subcontractors)

Site workers are responsible for complying with this HASP, using the proper PPE, reporting unsafe acts and conditions, and following the work, safety, and health instructions of the PM and SHSO/SS.

2. Background

The Site historically functioned as a shoring equipment fabrication facility, and as a storage and truck loading/unloading facility more recently. Relevant background information is provided below, including a general description of the Site; a brief review of the Site's history with respect to hazardous material use, handling, and/or storage; and a review of known and potential releases of hazardous substances at the Site.

2.1 Site Description

The Site consists of one parcel within the Mott Haven section of the Bronx, NY. The Site (Block 2319, Lot 2) is approximately 67,000 square feet and is bordered to the northwest and northeast by commercial properties, to the southeast by the Third Avenue Bridge, and to the southwest by the Harlem River. The Site is currently vacant and contains no structures. The area surrounding the property is highly urbanized and predominantly consists of heavy commercial/industrial/warehouse properties to the north along a corridor adjacent to the Harlem River. Multi-use residential/commercial (retail) properties are present to the east along Bruckner Boulevard.

There are no schools or daycare facilities within 1,000 ft of the Site.

2.2 Site History

The Site was historically used for manufacturing purposes since 1891, the most recent being Mugler Richard Shoring Company, Inc. (Mugler Inc.) who used the Site for shoring equipment fabrication, storage, truck loading/unloading, and equipment repairs. The Site is currently undergoing construction of a new building with three towers that reach 19 to 28 stories. Portions of the building include below grade parking and maintenance areas. The future use of the redevelopment will consist of residential space, a portion of which will be affordable housing units. The future building will have an overall footprint of 18,716 square feet (sq. ft). The portion of the Site that is not occupied by the building or associated concrete paving is covered by a New York State Department of Environmental Conservation (NYSDEC)-approved cover system, consisting of a demarcation layer overlain by 2 ft of clean stone.

2.3 Known and Potential Releases of Hazardous Substances at the Site

All former buildings at the Site have been demolished. There is potential for historic fill of unknown origin and buried structures from demolition activities at the Site.

At the Site, previous investigations found historic fill material containing metals and semivolatile organic compounds (SVOCs) above NYSDEC Part 375 Restricted Residential Soil Cleanup Objectives (RRSCOs). The results of sampling previously performed identified petroleum related contaminants in soil to a depth of 8 feet in the vicinity of a suspect 550-gallon abandoned underground storage tank (UST). Two locations of sampled groundwater identified MTBE, and chloromethane was reported above its groundwater standard at one location. PCB Aroclor-1254 was also reported above standards in one of the wells. There is an open spill on the Site (Spill Case No. 1405230). The spill was opened and petroleum-like odors and photoionization detector (PID) readings up to 700 ppm were observed during the Phase II completed in October 2014. A monitoring well was subsequently installed at the same location and groundwater analytical results indicated the presence of a petroleum release. All impacted material related to Spill Case No. 1405230 was disposed of offsite during the remedial excavation. A significant amount of historic fill was also removed from the Site during remedial excavation, however, SVOCs and metals still exist in soil at concentrations exceeding RRSCOs in areas of the Site. All remaining soil contamination at the Site has been addressed by the NYSDEC-approved Site cover system.

3. Scope of Work

The scope of work to be implemented during future redevelopment work at the Site may include the following:

- Oversight of excavations and backfill;
- Possible collection of soil samples related to redevelopment;
- Site inspections;
- Community Air Monitoring Plan (CAMP) implementation; and
- Oversight of soil trucking.

Detailed scopes of work for these activities will be prepared prior to implementation of the tasks.

If there are any changes with the scope a revision of the HASP will be required to address any new hazards.

4. Site Control

This site control program is designed to reduce the spread of hazardous substances from contaminated areas to clean areas, to identify and isolate contaminated areas of the Site, to facilitate emergency evacuation and medical care, to prevent unauthorized entry to the Site, and to deter vandalism and theft.

4.1 Site Map

A map of the Site, showing Site boundaries, designated work zones, and points of entry and exit is provided in Figure 2.

4.2 Site Access

Access to the Site is restricted to reduce the potential for exposure to its safety and health hazards. During hours of site operation, Site entry and exit is authorized only at the points identified in Figure 2. Access for all equipment will be through designated Site entries and exits yet to be established. Roux will maintain Site access throughout the workday and lock all entrances and exits at the end of the day.

4.3 Buddy System

While working in the Exclusion Zone (EZ), if any is established, Site workers use the buddy system. The buddy system means that personnel work in pairs and stay in close visual contact to be able to observe one another and summon rapid assistance in case of an emergency. The responsibilities of workers using the buddy system include:

- Remaining in close visual contact with partner;
- Providing partner with assistance as needed or requested;
- Observing partner for signs of heat stress or other difficulties;
- Periodically checking the integrity of partner's PPE; and
- Notifying the Site manager or other Site personnel if emergency assistance is needed.

4.4 Site Communications

The following communication equipment is used to support onsite communication: visual hand signals will be used during the use of the drill rig, and workers will have cell phones onsite. Should multiple operations be occurring at the Site concurrently, radios shall be issued for communication, if determined to be necessary.

A current list of emergency contact numbers shall be posted at the worksite and provided to Site workers as appropriate.

4.5 Site Work Zones

This Site is divided into three major zones, described below. These zones are characterized by the presence or absence of biological, chemical, or physical hazards and the activities performed within them. Zone boundaries are clearly marked at all times and the flow of personnel among the zones is controlled. The Site is monitored for changing conditions that may warrant adjustment of zone boundaries. Zone boundaries are adjusted as necessary to protect personnel and clean areas. Whenever boundaries are adjusted, zone markings are also changed, and workers are immediately notified of the change.

Exclusion Zone

The area where contamination exists is the EZ. All areas where excavation and handling of contaminated materials take place are considered the EZ. This zone will be delineated by orange high visibility fencing. Safety tape may be used as a secondary delineation within the EZ. The zone delineation markings may be opened in areas for varying lengths of time to accommodate equipment operation or specific construction activities. The SHSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Personnel are not allowed in the EZ without:

- A buddy (co-worker)
- Required minimum level PPE
- Medical Authorization
- Training certification
- Requirement to be in the zone

Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) is established between the exclusion zone and the support zone. The CRZ contains the Contamination Reduction Corridor (CRC) and provides an area for decontamination of personnel and equipment. The CRZ will be used for general Site entry and egress in addition to access for heavy equipment and emergency support services. Personnel are not allowed in the CRZ without:

- A buddy (co-worker)
- Appropriate PPE
- Medical authorization
- Training certification
- Requirement to be in the zone

Support Zone

The Support Zone (SZ) is an uncontaminated area that will be the field support area for the Site operations. The SZ will contain the temporary project trailers and provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

5. Job Hazard Evaluation

Roux work at the Site is expected to entail a variety of physical, chemical, and biological hazards, all of which must be sufficiently managed to allow the work to be performed safely. Some of the hazards are Site-specific, (i.e., they are associated with the nature, physical characteristics, and/or routine operation of the Site itself) while others are activity-specific (i.e., they are associated with [or arise from] the particular activity being performed). The various hazards can be grouped into the following categories:

Caught/Crushed – The potential to become caught in, under, between, or by an object or parts of an object, such as equipment with parts that open and close or move up and down ("pinch points") or equipment that rotates, and the accompanying potential to have body parts cut, mangled, or crushed thereby.

Contact – The potential to be struck by or against moving or stationary objects that can cause physical injury, such as heavy machinery, overhead piping, moving vehicles, falling objects, and equipment (including tools and hand-held equipment) or infrastructure with the ability to cut or impale.

Energy Sources – The potential for bodily harm associated with energy sources, most notably electricity, but also including latent energy sources such as compressed air and equipment under tension (which when released could cause injurious contact or a fall).

Ergonomics – The potential for musculoskeletal injury associated with lifting/carrying, pushing/pulling, bending, reaching, and other physical activity attributable to poor body position/mechanics, repetitive motion, and/or vibration.

Exposure – The potential for injury/illness due to physical, chemical, or biological exposures in the work environment, including, but not limited to, temperature extremes, solar radiation, noise (physical), chemical splashes and hazardous atmospheres (chemical), and animal/insect bites and poisonous plants (biological).

Falls – The potential to slip or trip and thus fall or drop a load, resulting in bodily injury to oneself or others.

The foregoing is intended to provide Roux employees, Client, and Subcontractors with a general awareness of the hazards involved with Site work. A more detailed review of the potential hazards associated with each specific activity planned for the Site (or ongoing activity, as the case may be) is provided in the activity-specific Job Safety Analysis (JSA) forms in Appendix A. As can be seen in the JSA forms, the hazards are identified by category per the above, and specific measures designed to mitigate/manage those hazards are also identified. In preparing the JSA forms, all categories of hazards were considered, and all anticipated potential hazards were identified to the extent possible based on the experience of the personnel preparing and reviewing the JSA forms. However, there is always the possibility for an unanticipated hazard to arise, potentially as conditions change over the course of the workday. Roux personnel must maintain a continual awareness of potential hazards in the work zone, regardless of whether the hazard is identified in the JSA form. Particular attention should be paid to hazards associated with exposure to hazardous substances (see Table 1 for a listing of the hazardous substances most likely to be encountered in environmental media at the Site) and to Site personnel being located "in the line of fire" with respect to moving equipment, pinch points, and latent energy, (e.g., being located or having body parts located within the swing radius of an

excavator, between two sections of pipe being connected, below a piece of suspended equipment, or adjacent to a compressed air line).

5.1 Employee Notification of Hazards and Overall Site Information Program

The information in the JSAs and safety data sheets (SDSs) is made available to all employees and subcontractors who could be affected by it prior to the time they begin their work activities. Modifications to JSAs are communicated during routine pre-work briefings. SDSs will be maintained by the SHSO/SS for chemicals brought onsite. Copies of SDSs can be found in Appendix B.

6. Emergency Response Plan

This emergency response plan details actions to be taken in the event of Site emergencies. The PM and SHSO is responsible for the implementation of emergency response procedures onsite. The SHSO/PM provides specific direction for emergency action based upon information available regarding the incident and response capabilities and initiates emergency procedures and notification of appropriate authorities. In the event of an emergency, Site personnel are evacuated and do not participate in emergency response activities, response is facilitated through external emergency services.

6.1 Emergency Response

The SHSO, after investigating the incident and relevant information, shall determine the level of response required for containment, rescue, and medical care. Limited onsite emergency response activities could occur, therefore, the SHSO is responsible for notifying external emergency response agencies. The SHSO provides relevant information to the responding organizations, including, but not limited to, the hazards associated with the emergency incident, potential containment problems, and missing Site personnel.

6.2 Emergency Alerting and Evacuation

If evacuation notice is given, Site workers must leave the worksite, if possible, by way of the nearest exit. Appropriate primary and alternate evacuation routes and assembly areas have been identified and are shown on the Site Plan (Figure 2). The routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by the SHSO/PM.

Personnel exiting the Site gather at a designated assembly point. To determine that everyone has successfully exited the Site, personnel will be accounted for at the assembly Site. If any worker cannot be accounted for, notification is given so that appropriate action can be initiated. Subcontractors on this Site have coordinated their emergency response plans to ensure these plans are compatible and potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying upon them.

6.3 Emergency Medical Treatment and First Aid

In the event of a work-related injury or illness, employees are required to follow procedures outlined below. All work-place injury and illness situations require the Roux Project and Corporate Management Team to be notified when an injury / illness incident occurs, and communication with the contracted Occupational Health Care Management Provider, AllOne Health, is initiated. The Injury/Illness Notification Flowchart is provided below.

If onsite personnel require any medical treatment, the following steps will be taken:

a. Notify Roux Project and Corporate Management Team for any work-related injury and/or illness occurrence. Communicate with the contracted Occupational Health Care Management Provider, AllOne Health, immediately following the notifications provided above.

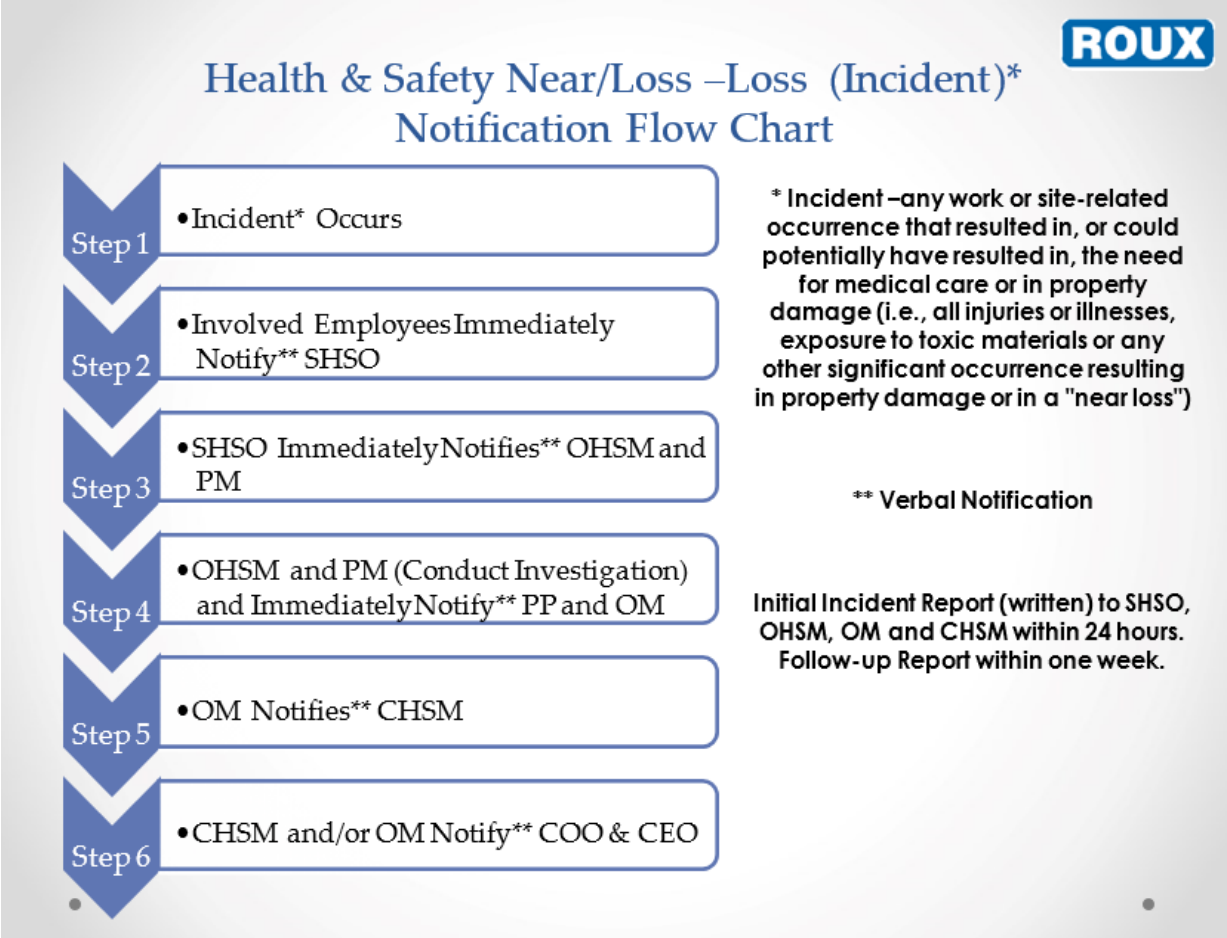
b. Based on discussions with the Project Team, Corporate Management, and the AOH evaluation, if medical attention beyond onsite First Aid is warranted, transport the injured / ill person (IP) to the Urgent Care Center, or notify the Fire Department or Ambulance Emergency service and request an ambulance or transport the victim to the hospital, and continue communications with the Corporate

Management Team. A Hospital Route and Urgent Care Facility map with directions to Lincoln Medical Center and AFC Urgent Care, respectively, is included as Figure 3.

c. Decontaminate to the extent possible prior to administration of First Aid or movement to medical or emergency facilities.

d. First aid medical support will be provided by onsite personnel trained and certified in First Aid, Cardiopulmonary Resuscitation (CPR), Automatic External Defibrillation (AED), and Blood-Borne Pathogens (BBP) Awareness, until relieved by emergency medical services (EMS).

e. The SHSO and PM will perform a Loss Investigation (LI) and the Project Team will complete the final Loss Report. If a Roux employee is involved in a vehicular incident, the employee must also complete the ACORD® Automobile Loss Notice.



6.4 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO or project principal will determine if work can continue without sacrificing the health and safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related conditions.
- Limited visibility.

- Electrical storm potential.

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lightning. Observe daily weather reports and evacuate if necessary in case of inclement weather conditions.

6.5 Electrical Storm Guidelines

In the event that lightning and/or thunder are observed while working outdoors, all outdoor activities shall stop and personnel shall seek proper shelter (e.g., substantial building, enclosed vehicle, etc.). Work shall not resume until the threat of lighting has subsided and no lightning or thunder has been observed for 30 minutes. If the possibility of lightning is forecast for the day, advise the onsite personnel of the risks and proper procedure at the pre-work safety briefing. Continuously monitor for changing weather conditions and allow enough time to properly stop work if lightning is forecast.

7. Safety Procedures

This section of the HASP presents the specific safety procedures to be implemented during Roux activities at the Site in order to protect the health and safety of various onsite personnel. Minimum OSHA-mandated procedures are presented first, followed by client- and Site-specific procedures. Lastly, activity-specific procedures are discussed. These Site and activity-specific procedures supplement the general safety procedures included in Roux's Corporate Health and Safety Manual, which also must be followed in their entirety.

7.1 Training

At a minimum, Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety-trained prior to performing work onsite per OSHA 29 CFR 1910.120(e) and 29 CFR 1926.65(e). More specifically, all Roux, subcontractors, and other personnel engaged in sampling and remedial activities at the Site and who are exposed or potentially exposed to hazardous substances, health hazards, or safety hazards must have received, at a minimum, the 40-hour initial HAZWOPER training consistent with the requirements of 29CFR 1910.120(e)(3)(i) training and a minimum of three days' actual field experience under the direct supervision of a trained experienced supervisor, plus 8 hours of refresher training on an annual basis. Depending on tasks performed, less training may be permitted. Evidence of such training must be maintained at the Site at all times. Furthermore, all onsite management and supervisory personnel directly responsible for or who supervise the employees engaged in Site remedial operations, must have received an additional 8 hours of specialized training at the time of the job assignment on topics including, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques, plus 8 hours of refresher training on an annual basis.

Roux personnel training records are maintained in a corporate database with records available upon request from either the OHSM/SHSO/Corporate Health and Safety Manager (CHSM) or Human Resources Department. Subcontractors onsite will be required to maintain and provide training records to Roux. These records shall be maintained with the SHSO onsite.

7.2 Site-Specific Safety Briefings for Visitors

A Site-specific briefing is provided to all Site visitors who enter this Site beyond the Site entry point. For visitors, the Site-specific briefing provides information about Site hazards, the Site layout including work zones and places of refuge, the emergency alarm system and emergency evacuation procedures, and other pertinent safety and health requirements as appropriate.

7.3 HASP Information and Site-Specific Briefings for Workers

Site personnel review this HASP and are provided a Site-specific tailgate briefing prior to the commencement of work to ensure that employees are familiar with this HASP and the information and requirements it contains as well as relevant JSAs. Additional briefings are provided as necessary to notify employees of any changes to this HASP as a result of information gathered during ongoing Site characterization and analysis. Conditions for which we schedule additional briefings include, but are not limited to, changes in Site conditions, changes in the work schedule/plan, newly discovered hazards, and incidents occurring during Site work.

7.4 Medical Surveillance

The medical surveillance section of the Health and Safety Plan describes how worker health status is monitored at this Site. Medical surveillance is used when there is the potential for worker exposure to hazardous substances at levels above OSHA permissible exposure limits or other published limits. The purpose of a medical surveillance program is to medically monitor worker health to ensure that personnel are not adversely affected by Site hazards. The provisions for medical surveillance at this Site are based on the Site characterization and job hazard analysis found in Section 4 of this HASP and are consistent with OSHA requirements in 29 CFR 1910.120(f).

7.4.1 Site Medical Surveillance Program

Medical surveillance requirements are based on a worker's potential for exposure as determined by the Site characterization and job hazard analysis documented in Section 4 and JSAs within Appendix A of this HASP and in compliance with the requirements of 29 CFR 1910.120(f)(2). Based on Site information and use of direct reading instruments, limited use of respirators (less than 30 days per year), and the absence of an employee-staffed HAZMAT team, a limited medical surveillance program is required and implemented at this Site. The medical surveillance program provides that:

1. Workers assigned to tasks requiring the use of respirators receive medical examinations in accordance with 29 CFR 1910.134(e) to ensure they are physically capable to perform the work and use the equipment.
2. If a worker is injured, becomes ill, or develops signs or symptoms of possible over-exposure to hazardous substances or health hazards, medical examinations are provided to that worker as soon as possible after the occurrence and as required by the attending physician.
3. These medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to workers free of cost, without loss of pay, and at a reasonable time and place. In addition, the need to implement a more comprehensive medical surveillance program will be re-evaluated after any apparent over-exposure.

7.4.2 Medical Recordkeeping Procedures

Medical recordkeeping procedures are consistent with the requirements of 29 CFR 1910.1020 and are described in the company's overall safety and health program. A copy of that program is available at our Islandia, NY office.

The following items are maintained in worker medical records:

- Respirator fit test and selection
- Physician's medical opinion of fitness for duty (pre-placement, periodic, termination)
- Physician's medical opinion of fitness for respirator protection (pre-placement, periodic)
- Exposure monitoring results

7.4.3 Program Review

The medical program is reviewed to ensure its effectiveness. The CHSM in coordination with the Human Resources Director is responsible for this review. At minimum, this review consists of:

- Review of accident and injury records and medical records to determine whether the causes of accidents and/or illnesses were promptly investigated and whether corrective measures were taken wherever possible;

- Evaluation of the appropriateness of required medical tests based on Site exposures; and
- Review of emergency treatment procedures and emergency contacts list to ensure they were Site-specific, effective, and current.

7.5 Personnel Protection

Site safety and health hazards are eliminated or reduced to the greatest extent possible through engineering controls and work practices. Where hazards are still present, a combination of engineering controls, work practices, and PPE are used to protect employees. Appropriate PPE shall be worn by Site personnel when there is a potential exposure to chemical hazards or physical hazards (e.g., falling objects, flying particles, sharp edges, electricity, and noise), as determined by the SHSO. The level of personal protection, type, and kind of equipment selected will depend on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors will be made before work can be safely executed.

Roux maintains a comprehensive written PPE program that addresses proper PPE selection, use, maintenance, storage, fit, and inspection. PPE to be used at the Site will meet the appropriate American National Standards Institute (ANSI) standards and the following OSHA (General Industry) standards for minimum PPE requirements. This program can be found in Appendix C.

The minimum level of PPE for entry onto the Site is Level D. The following equipment shall be worn:

- Work uniform (long pants, sleeved shirt)
- Hard hat
- Steel or composite toe work boots
- Safety glasses (must comply with one of the following ANSI/ISEA Z87.1-2010, ANSI Z87.1-2003, ANSI Z87.1-2003)
- Boot covers (as needed)
- Hearing protection (as needed)
- High visibility clothing (shirt/vest)
- Hand protection (e.g., minimum cut resistance meeting ANSI 105-2000 Level 2)

Note jewelry shall be removed or appropriately secured to prevent it from becoming caught in rotating equipment or unexpectedly snagged on a fixed object. (e.g., wrist watches, bracelets, rings, chains and necklaces, open earrings). Do not wear loose clothing and all shoulder length or longer hair should be tied back.

Site-specific PPE ensembles and materials are identified within task specific JSAs located within Appendix A. Levels of protection will be upgraded or downgraded in response to Site conditions. Upgrades to PPE can include use of hearing protection whenever noise levels exceed 85dBA, nitrile gloves worn whenever skin hazards exist or when handling samples, and whenever total organic vapors exceed levels specified elsewhere in this plan, respiratory protection is necessary. Although not expected, Level C would involve an APR Cartridge classified as Organic Vapors and P-100 cartridge. Any upgrades or downgrades of the level of protection (i.e., not specified in the JSA) must be immediately communicated to all Roux personnel and subcontractors as applicable. PPE is used in accordance with manufacturer's recommendations.

Intrusive activities (e.g., drilling, excavation activities, etc.) include any Site activity which will, or potentially will, result in exposure(s) to hazardous or toxic chemicals or physical agents at or above the permissible exposure limit (PEL), or to flammable or oxygen deficient atmospheres. Prior to commencing with any field activity, the potential for such conditions should be evaluated to determine air monitoring requirements. General procedures for air monitoring are described below. During intrusive activities, continuous monitoring may be performed using various meters outlined in Section 7.6 Monitoring.

7.5.1 Hearing Conservation

Hearing protection is made available when noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 dBA. Hearing protection is required when the 8-hour time weighted average sound level $\geq$ 90 dBA. Where noise exposure meets or exceeds this level, noise is listed as a physical hazard in the JSA for the tasks/operation, and hearing protection is included as one of the control measures (PPE).

7.6 Monitoring

An air monitoring program is important to the safety of onsite and offsite personnel. A preliminary survey, to establish background conditions in the immediate sampling area, may be made prior to the initiation of Site work including, but not limited to, monitoring wind direction and approximate temperature during all invasive Site activities. This survey will be conducted with the appropriate air monitoring instrument(s) as warranted by the field activity. Once this survey has been complete, any change in the type of PPE will be determined.

Air monitoring will be performed to verify the proper level of equipment is used and to determine if increased PPE or work stoppage is required. The following equipment may be used to monitor conditions:

- A PID with a lamp energy of 10.6 eV will be used to provide direct readings of organic vapor concentrations during intrusive activities to determine that personnel protection is adequate. Concentrations shall be recorded during intrusive activities with the potential to encounter contaminant vapors.
- In accordance with the DER-10 Technical Guidance for Site Investigation and Remediation dated May 2010 (DER-10) issued by the NYSDEC, a CAMP will be implemented during intrusive Site activities. The Generic CAMP as provided in DER-10, Appendix 1A, is included in Appendix D of this HASP and includes action levels.

Monitoring equipment will be calibrated in accordance with applicable regulatory requirements and manufacturer specifications.

Below are monitoring action levels for Site-specific chemicals of concern. In the event that PID readings above the thresholds identified below are sustained for 5 minutes in the breathing zone, worker protection will require upgrading following notification to the OHSM and applicable parties (e.g., client, board of health, regulators, etc.).

PID Action Levels

Site Action Levels	
PID Reading in Breathing Zone (ppm)	**Action**
<5	No Action
≥5 - <25	Level C
≥25	Cease Field Operations

If PID measurements exceed 25 ppm above background for 5 minutes in the breathing zone, work activities will cease until airborne vapor levels can be reduced to less than 25 ppm and are quantified or the SHSO determines alternate methods to be followed in order to proceed.

7.6.1 Action Levels for Air Monitoring

PPE can remain at Level D if breathing zone VOC concentrations are less than 5 ppm and benzene is non-detect. Personnel are required to evacuate the Site when breathing zone VOC readings exceed 25 ppm.

The following tables include summaries of the air monitoring, work practices, and action levels for the expected contaminants. The action levels to initiate testing with colorimetric tubes for airborne volatiles is 1 ppm (PID reading) and is based on the Permissible Exposure Limit (PEL) for benzene (1 ppm). The colorimetric tubes are used to confirm the presence or absence of specific constituents, and they do not provide a measured concentration.

Air Monitoring Summary and Action Levels Organic Vapors	
PID Reading in Breathing Zone (ppm)[1]	**Action**
0-1 ppm above background[2]	Continue monitoring
1-5 ppm sustained 60 seconds	Continue monitoring, if applicable initiate additional collection of benzene using colorimetric tubes.
<5 ppm and no presence of benzene	Continue Monitoring, ventilate space
≥ 5 ppm - ≤ 25 ppm and no presence of benzene	Ventilate space until PID reads < 5 ppm. If < 25 ppm cannot be achieved, upgrade to Level C[3].
≥ 25 ppm	Ventilate space and evacuate area.

1 Based on relative response/sensitivity of PID to benzene.

2 Background concentrations should be established at the beginning of each workday. It may be necessary to re-establish background concentrations as ambient conditions vary through the day.

3 Measured air concentrations of known organic vapors will be reduced by the respirator to one half of the PEL or lower, and the individual and combined compound concentrations shall be within the service limit of the respirator cartridge.

Air Monitoring Summary and Action Levels Oxygen	
O_2 Reading in Breathing Zone (%)[1]	**Action**
20.9% O_2	Oxygen level normal
< 19.5% O_2	Oxygen deficient Interrupt task/Evacuate area
>23.5% O_2	Oxygen enriched Interrupt task/Evacuate area

1. Action levels based on USEPA Standard Operating Safety Guides; Table 5-1, Atmospheric Hazard Action Guidelines may be further restricted based on the CHSM's professional judgment and experience.

Air Monitoring Summary and Action Levels Carbon Monoxide	
CO Reading in Breathing Zone (ppm)[1]	**Action**
<25 ppm	Inspect exhaust system for leaks or other sources of CO. Monitor initially and every 15 minutes during use of CO-generating equipment
25-50 ppm	Ventilate area. Monitor continuously and record measurements. Contact PM.
>50 ppm	Cease Field Operations. Ventilate area.

1. Based upon the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) of 25 ppm as an 8-hour time weighted average (TWA) and OSHA's Permissible Exposure Limit (PEL) of 50 ppm as an 8-hour TWA concentration.

Air Monitoring Summary and Action Levels Combustible Gases	
Lower Explosive Limit (LEL) Reading	**Action**
< 4% LEL (<2,000 ppm)	Site activities will continue with normal monitoring
4% – 20% LEL (2,000 – 10,000 ppm)	Stop work until levels dissipate to <4% LEL
> 20% LEL (>10,000 ppm)	Potential explosion hazard. Halt all Site activities, research source of release, aerate work area, suppress source

Air Monitoring Summary and Action Levels Hydrogen Sulfide	
Hydrogen Sulfide (H_2S) Reading	**Action**
<10 ppm	Site activities will continue with normal monitoring
>10 ppm	Stop work until levels dissipate to <10 ppm; use mechanical ventilation if possible
Cannot use air purifying respirators for H_2S because of olfactory fatigue	

7.6.2 Air Monitoring Equipment and Calibration

A PID calibrated to an appropriate calibration mixture will be used to detect organic vapors in and around the work areas. Monitoring will be conducted in and around all work areas and at the workers breathing zone before activities commence to establish a background level, then at 15-minute intervals throughout the day. All equipment will be calibrated according to the manufacturer's recommendation. A calibration log will be maintained and will include the name of the person who performed the calibration, the date and time calibrated, and the instrument reading at the time of calibration. A manual bellows pump or equivalent with colorimetric tubes for formaldehyde will be utilized to determine the course of action related to upgrading or downgrading the level of respiratory protection, as applicable.

If air monitoring data indicate safe levels of potentially harmful constituents at consistent intervals (5-minute intervals), then monitoring can be conducted less frequently (every 30 minutes). This determination will be made by the onsite SHSO. Monitoring data, including background readings and calibration records, will be documented. Work to be performed onsite will conform to Roux Associates' Standard Operating Procedures (SOPs). Conformance with these guidelines as well as the guidelines described in this HASP will aid in mitigating the physical and chemical hazards mentioned throughout this HASP.

7.7 Tailgate Safety Meetings

A designated Site worker will provide daily safety briefings (e.g., tailgate meetings) including, but not limited to, the following scenarios:

- When new operations are to be conducted;
- Whenever changes in work practices must be implemented; and
- When new conditions are identified and/or information becomes available.

Daily safety briefings shall be recorded on the Roux Daily Tailgate Health and Safety Meeting Log/Daily Site Safety Checklist, and all completed forms will become a part of the project file. The Safety Meeting Log is provided in Appendix E of this HASP.

7.8 Spill Containment

Spill containment equipment and procedures should, at a minimum, meet the requirements of the facility's Spill Prevention, Control, and Countermeasure Plan, if applicable. Otherwise, spill containment equipment and procedures must be considered depending on the task including, but not limited to, chemical/product transfer points and handling.

7.8.1 Initial Spill Notification and Response

Any worker who discovers a hazardous substance spill will immediately notify the SHSO/SS. The worker will, to his/her best ability, report the hazardous substance involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, and any associated injuries without compromising his/her own safety.

7.8.2 Spill Evaluation and Response

In coordination with the SHSO/SS, the PM (Lauren Dolginko) is responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area will be isolated and demarcated to the extent possible. If necessary, to protect nearby community members, notification of the appropriate authorities is made by the PM as appropriate. Onsite response is limited to small spills (e.g., <10 gallons); large spills require external emergency responders who will be contacted by the SHSO.

7.9 Decontamination

The decontamination section of the HASP describes how personnel and equipment are decontaminated when they leave the EZ. This section also describes how residual waste from decontamination processes is disposed. The Site decontamination procedures are designed to achieve an orderly, controlled removal or neutralization of contaminants that may accumulate on personnel or equipment. These procedures minimize worker contact with contaminants and protect against the transfer of contaminants to clean areas of the Site and offsite. They also extend the useful life of PPE by reducing the amount of time contaminants contact and can permeate PPE surfaces. Decontamination is facilitated within the contamination reduction zone at this Site.

7.9.1 Decontamination Procedures for Personnel and PPE

The following are general decontamination procedures established and implemented at this Site.

- Decontamination is required for all workers exiting a contaminated area. Personnel may re-enter the SZ only after undergoing the decontamination procedures described below in the next section.
- Protective clothing is decontaminated, cleaned, laundered, maintained, and/or replaced as needed to ensure its effectiveness.
- PPE used at this Site that requires maintenance or parts replacement is decontaminated prior to repairs or
- PPE used at this Site is decontaminated or prepared for disposal on the premises. Personnel who handle contaminated equipment have been trained in the proper means to do so to avoid hazardous exposure.
- This Site uses an offsite laundry for decontamination of PPE. The Site has informed that facility of the hazards associated with contaminated PPE from this Site.
- The Site requires and trains workers if their permeable clothing is splashed or becomes wetted with a hazardous substance to immediately exit the work zone, perform applicable decontamination procedures, shower, and change into uncontaminated clothing.
- Procedures for disposal of decontamination waste meets applicable local, state, and federal regulations.

7.9.2 Decontamination Procedures for Equipment

All tools, equipment, and machinery from the EZ or CRZ are decontaminated in the CRZ prior to removal to the SZ. Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure and to avoid cross-contamination and chemical incompatibilities.

General Equipment Decontamination Procedures that may apply:

1. Decontamination is required for all equipment exiting a contaminated area. Equipment may re-enter the SZ only after undergoing the equipment decontamination procedures.
2. Vehicles that travel regularly between the contaminated and clean areas of the Site are carefully decontaminated each time they exit the EZ and the effectiveness of that decontamination is monitored to reduce the likelihood that contamination will be spread to other parts of the Site.
3. Particular attention is given to decontaminating tires, scoops, and other parts of heavy equipment that are directly exposed to contaminants and contaminated soil.

The following items may be used to decontaminate equipment:

- Fresh water rinse;
- Non-phosphorus detergent wash;
- Distilled water rinse;
- Acetone rinse;
- Distilled water rinse; and
- A steam cleaner or pressure washer (heavy equipment only).

7.9.3 Monitoring the Effectiveness of Decontamination Procedures

Visual examination and sampling are used to evaluate the effectiveness of decontamination procedures. Visual examination is used to ensure procedures are implemented as described appear to control the spread of contaminants under changing Site conditions. Visual examination is also used to inspect for signs of residual contamination or for contaminant permeation of PPE.

Personnel who work in contaminated areas of the Site, either the CRZ or the EZ, are trained in the principles and practices of decontamination described in this section of the HASP and in related SOPs. If Site procedures are changed as a result of inspection and monitoring, all affected employees are notified of these changes.

7.10 Confined Space Entry

For the purpose of this project, all confined spaces are considered permit required and will not be performed by Roux personnel or any personnel within Roux's oversight. Confined space means a space with the following characteristics:

- Large enough and so configured that an employee can barely enter and perform assigned work;
- Limited or restricted means of entry and exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits); and
- Not designed for continuous employee occupancy.

7.11 Client and Site-Specific

In addition to the OSHA-specific procedures discussed above, there may be client and Site-specific safety procedures that must be adhered to during the performance of remedial activities at the Site.

7.12 Unusual or Significant Risks

Field activities that appear to have unusual or significant risks that cannot be adequately managed with existing risk tools such as HASPs, traffic safety plans, work permits, design and O&M practices, equipment HAZOPS, or other safety tools must be referred to the CHSM to help with the assessment and management of the associated potential safety risks. Examples include the use of explosives for demolition, use of firearms to control wildlife, rappelling, demolition over water, etc.

7.13 Activity-Specific

In addition to the general hazards discussed above, there are activity-specific hazards associated with each work activity planned for the Site. An activity-specific JSA has been completed for each of the activities planned for the Site. JSAs are provided in Appendix A. In the event new work activities or tasks are planned, JSAs will be developed and implemented prior to performing the new activities. In the absence of a JSA, the personnel performing work must prepare a field JSA and receive clearance from a designated competent safety official prior to performing any task with significant risk. In emergency situations where time is critical, SPSAs will be utilized to identify the task, associated hazards, and mitigative actions to take. For lower risk activities (as deemed by the discretion of a Competent Person) in which a JSA is determined to not be needed, the individual(s) conducting the activities must perform SPSAs prior to and during the work.

7.13.1 Electrical and Other Utility Assessment and Accommodations

Roux shall perform a Site walk to identify any potential overhead electrical or utility lines. All applicable guidelines will be followed in the vicinity of overhead power and utility lines (see Section 7.13.3 below).

Prior to the start of work onsite, onsite contractors marked out and removed any potential underground utility lines. Utility lines at the Site have not been of concern during the redevelopment thus far.

Roux has also reviewed all available Site maps showing buried utility lines to identify potential hazards, which revealed that no underground hazards are known to exist in the vicinity of the areas of the Site pertinent to this HASP.

7.13.2 Subsurface Work

Subsurface work activities will require adherence to Roux's Corporate Subsurface Utility Clearance Management program found within Appendix F.

7.13.2.1 Excavations and Trenching

All trenching and excavation work activities contracted by Roux shall comply with 29 CFR 1926.651-652 Subpart P. Additionally, for trenches greater than 4 feet deep, where employees will enter, the trench needs to have a stairway or ladder or other safe means of egress. Where employees will enter trenches greater than 5 feet deep, the trench must have some type of protective system or sloped appropriately to prevent cave-ins.

The SHSO will be present onsite during all Roux contracted excavation and backfill operations and will supplement health and safety monitoring conducted by Subcontractor air quality screening to ensure that appropriate levels of protection and safety procedures are utilized. The proximity of chemical, water, sewer, and electrical lines will be identified by Roux and/or their subcontractor before any subsurface activity or sampling is attempted.

The following safe work practices will be implemented during this task.

- The proximity of chemical, water, sewer, and electrical lines will be identified by a facility representative prior to beginning any subsurface activity.
- While earthmoving, stay out of the excavator's delineated heavy equipment exclusion zone and away from the excavation sides, where there is potential for cave in (within excavations that are 6 feet or more in depth, a delineated perimeter 6 feet away from the excavated edge is required).

Maximum Allowable Slopes

Soil or Rock Type	Maximum Allowable Slopes (H:V)[1] for Excavations Less Than 20 Feet Deep[3]	
Stable Rock	Vertical	(90°)
Type A[2]	3/4 : 1	(53°)
Type B	1 : 1	(45°)
Type C	1 1/2 : 1	(34°)

OSHA (29 CFR 1926.652, Subpart P, Appendices A and B)

Notes:

1 Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

2 A short-term maximum allowable slope of 1/2H : 1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 meters) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 meters) in depth shall be 3/4H : 1V (53°).

3 Sloping or benching for excavations greater than 20 feet deep shall be designed and stamped by a registered professional engineer.

Proper stockpiling (i.e., 2 feet minimum distance from the excavation edge), containment, transport, storage, and disposal practices will be utilized and is dependent upon the potential type and amount of waste generated during operations. The location of safety equipment and evacuation procedures will be established prior to initiation of operations according to this HASP.

7.13.3 Heavy Equipment

Use of heavy equipment at the Site will require adherence to Roux's Corporate Heavy Equipment Exclusion Zone Management Program found within Appendix G. Additionally, operation of the drill rig/other heavy equipment will maintain clearances from overhead power lines in accordance with OSHA 29 CFR1926.1408 Table A Minimum Clearance Distances provided below.

Minimum Required Clearances for Energized Overhead Power Lines

Nominal System Voltage of Power Line (K V)	Minimum Required Clearance (feet)
0-50	10

Minimum Required Clearances for Energized Overhead Power Lines

Nominal System Voltage of Power Line (K V)	Minimum Required Clearance (feet)
51-100	12
101-200	15
201-300	20
301-500	25
501-750	35
751-1000	45

1 kilovolt (KV) = 1,000 volts

7.14 Heat Stress

The National Oceanic and Atmospheric Administration records average maximum temperatures of 106 degrees Fahrenheit during the year in Bronx County, New York.

7.14.1 Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of PPE in hot weather environments. Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat stress are as follows:

- Severe muscle cramps, usually in the legs and abdomen;
- Exhaustion, often to the point of collapse; and
- Dizziness or periods of faintness.

First aid treatment includes, but is not limited to, shade, rest, and fluid replacement. Typically, the individual should recover within one-half hour while being monitored constantly. If the individual has not improved substantially within 30 minutes and the body temperature has not decreased, the individual should be transported to a hospital for medical attention.

7.14.2 Heat Exhaustion

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin to rid the body of excess heat through transference. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin with heavy perspiration;
- Skin appears pale;
- Fatigue and weakness;
- Dizziness; and

- Elevated body temperature.

First aid treatment includes, but is not limited to, cooling the victim, elevating the feet, and replacing fluids.

If the individual is not substantially improved within 30 minutes and the body temperature has not decreased, the individual should be transported to the hospital for medical attention.

7.14.3 Heat Stroke

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a MEDICAL EMERGENCY requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- Dry, hot red skin;
- Body temperature approaching or above 105 degrees F;
- Confusion, altered mental state, slurred speech;
- Seizures;
- Large (dilated) pupils; and
- Loss of consciousness – the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility. Heat stress is a significant hazard if any type of protective equipment (semi-permeable or impermeable) that prevents evaporative cooling is worn in hot weather environments.

7.15 Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole-body protection. Adequate insulating clothing must be used when the air temperature is below 60°F. A work/rest regimen will be initiated when ambient temperatures and protective clothing cause a stressful situation. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. The signs and symptoms of cold stress include the following:

- Severe shivering;
- Abnormal behavior;
- Slowing;
- Weakness;
- Stumbling or repeated falling;
- Inability to walk;
- Collapse; and/or
- Unconsciousness.

First aid requires removing the victim from the cold environment and seeking medical attention immediately. Also, prevent further body heat loss by covering the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks and encourage activity such as walking, wrapped in a blanket.

7.16 COVID-19

Measures for protecting workers from exposure to, and infection with, SARS-CoV-2, the virus that causes Coronavirus Disease 2019 (COVID-19), depend on the type of work being performed and exposure risk, including potential for interaction with people with suspected or confirmed COVID-19 and contamination of the work environment. Roux has performed an analysis of these risks based upon published government agency guidelines. Roux has developed health and safety guidance specific to COVID-19, which is provided as Appendix H. CDC's Face Covering Procedure is provided in Appendix I.

8. Field Team Review

Each person performing work at or visiting this Site shall sign this section after Site-specific training is completed and before being permitted to access the CRZ or EZ.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provision contained therein.

Site/Project: 2401 Third Avenue, Bronx, NY

Name Printed	Signature	Date

9. Approvals

By their signature, the undersigned certify that this HASP is approved and will be utilized at the Site.

TBD – Site Health and Safety Officer	Date
Kristina DeLuca – Office Health and Safety Manager	Date
Lauren Dolginko – Project Manager	Date
Frank Cherena – Project Principal	Date

TABLE

Toxicological, Chemical, and Physical Properties of Compounds Potentially Present at 2401 Third Avenue, Bronx, New York

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 2401 Third Avenue, Bronx, NY

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Acenaphthene	83-32-9	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Brown solid
Acenaphthylene	208-96-8	None Established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Yellow Solid Fl. Pt.=251°F
Arsenic (inorganic)	7440-38-2 (metal)	TWA 0.01 mg/m3	Ca C 0.002 mg/m3 [15-min]	TWA 0.010 mg/m3	Ca [5 mg/m3 (as As)]	Inhalation; ingestion; skin absorption; skin and/or eye contact	Ulceration of nasal septum, dermatitis, GI disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]	Liver, kidneys, skin, lungs, lymphatic sys	Metal: sliver-gray or tin-white, brittle, odorless solid BP: sublimes
Barium	7440-39-3	TWA 0.5 mg/m3	None established	TWA 0.5 mg/m3	None established	Inhalation, ingestion, skin contact	Irritation skin, respiratory system, digestive system	Skin, eyes, respiratory system	Yellow white powder BP: 1640 C
Benzene	71-43-2	TWA 0.5 ppm STEL 2.5 ppm	Ca TWA 0.1 ppm STEL 1 ppm	TWA 1 ppm ST 5 ppm	Ca [500 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Colorless to light yellow liquid with an aromatic odor [Note: Solid below 42 °F] BP: 176°F Fl.Pt. = 12°F LEL: 1.2% UEL: 7.8% Class B Flammable liquid
Benzo[a]anthracene	56-55-3	None established [skin cancer]	None established	None established	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	Irritation eyes, skin, respiratory system, CNS; skin cancer	Skin	Pale Yellow crystal, solid BP: 438 C
Benzo[a]pyrene	50-32-8	None established [cancer]	TWA 0.1 mg/m3	TWA 0.2 mg/m3	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	POISON. This material is an experimental carcinogen, mutagen, tumorigen, neoplastigen and teratogen. It is a probable carcinogen in humans and a known human mutagen. IARC Group 2A carcinogen. It is believed to cause bladder, skin and lung cancer. Exposure to it may damage the developing fetus. May cause reproductive damage. Skin, respiratory and eye irritant or burns.	Skin, eye, bladder, lung, reproductive	Yellow crystals or powder [found in cigarette smoke, coal tar, fuel exhaust gas and in many other sources] BP: 495 C
Benzo[b]fluoranthene	205-99-2	None established [cancer]	TWA 0.1 mg/m3	TWA 0.2 mg/m3	None established	Inhalation; ingestion; skin and/or eye contact	No data were identified on the toxicity of benzo[b]fluoranthene to humans. Based on results of studies in animals, IARC concluded that benzo[b]fluoranthene is possibly carcinogenic to humans	Respiratory system, skin, bladder, kidneys	Off-white to tan powder
Benzo[k]fluoranthene	207-08-9	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory tract, gastrointestinal; fatal if swallowed, inhaled, absorbed through the skin; vomiting, nausea, diarrhea	Lungs, respiratory system	Yellow crystals BP: 480 C
Benzo(g,h,i)perylene	191-24-2	None established	None established	California permisible exposure limits for chemical contaminants (Title 8, Article 107) PEL 0.2 mg/m3	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory tract, very toxic to aquatic life with long lasting effects	Eyes, skin, respiratory system	Pale Yellow -Green Crystals BP: 550°C
Beryllium	7440-41-7 (metal)	TWA 0.00005 mg/m^3	Ca C 0.0005 mg/m^3	TWA 0.002 mg/m^3 C 0.005 mg/m^3 (30 minutes) with a maximum peak of 0.025 mg/m^3	Ca [4 mg/m^3 (as Be)]	inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	Metal: A hard, brittle, gray-white solid. BP: 4532°F
Cadmium	7440-43-9 (metal)	TWA 0.01 mg/m^3	Ca	TWA 0.005 mg/m^3	Ca [9 mg/m^3 (as Cd)]	inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	respiratory system, kidneys, prostate, blood	Metal: Silver-white, blue-tinged lustrous, odorless solid. BP: 1409°F
Carbon Tetrachloride	56-23-5	TWA 5 ppm STEL 10 ppm	Ca ST 2 ppm (12.6 mg/m3) [60 minute]	TWA 10 ppm C 25 ppm 200 ppm (5-minute maximum peak in any 4 hours)	Ca [200 ppm]	inhalation, skin absorbtion, ingestion, skin and/or eye contact	irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]	central nervous system, eyes, lungs, liver, kidneys, skin	Colorless liquid with a characteristic ether-like odor. BP: 170°F
Carbon Monoxide	630-08-0	TWA 25 ppm	TWA 35 ppm C 200 ppm	TWA 50 ppm	1,200 ppm	inhalation	Carboxyhemogloemia	Blood	Colorless, odorless gas

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 2401 Third Avenue & 101 Lincoln Avenue,Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Chromium	7440-47-3	TWA 0.5 mg/m^3 (metal and Cr III compounds) TWA 0.05 mg/m^3 (water-soluble Cr VI compounds) TWA 0.01 mg/m^3 (insoluble Cr IV compounds)	TWA 0.5 mg/m^3	TWA 1 mg/m^3	250 mg/m^3 (as Cr)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid. BP: 4788°F
Chrysene; Phenanthrene; Pyrene; Coal tar pitch volatiles	65996-93-2	TWA 0.2 mg/m3	Ca TWA 0.1 mg/m^3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m^3 (benzene-soluble fraction)	Ca [80 mg/m^3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
Coal Tar Pitch Volatiles; Chrysene; Phenanthrene; Pyrene	65996-93-2	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m^3 (benzene-soluble fraction)	Ca [80 mg/m^3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
1,1-Dichloroethane	75-34-3	TWA 100 ppm	TWA 100 ppm (400 mg/m^3)	TWA 100 ppm (400 mg/m^3)	3000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation skin; central nervous system depression; liver, kidney, lung damage	Skin, liver, kidneys, lungs, central nervous system	Colorless, oily liquid with a chloroform-like odor. BP: 135°F Fl.P: 2°F UEL: 11.4% LEL: 5.4%
1,2-Dichloroethane (Ethylene Dichloride)	107-06-2	TWA 10 ppm	Ca TWA 1 ppm (4 mg/m^3) STEL 2 ppm (8 mg/m^3)	TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]	Ca [50 ppm]	inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.] BP: 182°F Fl.P: 56°F UEL: 16% LEL: 6.2% Class IB Flammable Liquid
1,2-Dichloroethene (total)	540-59-0	TWA 200 ppm	TWA 200 ppm (790 mg/m^3)	TWA 200 ppm (790 mg/m^3)	1000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor BP: 118-140°F Fl.P: 36-39°F UEL: 12.8% LEL: 5.6% Class IB Flammable Liquid
cis-1,2-Dichloroethene	156-59-2	TWA 200 ppm	TWA 200 ppm	TWA 200 ppm	None established	inhalation, skin absorption, ingestion	Harmful if swallowed, inhaled, or absorbed through skin. Irritant. Narcotic. Suspected carcinogen	Skin	Colorless liquid BP: 60 C Fl.P: 4 C UEL: 12.8% LEL: 9.7 %
trans-1,2-Dichloroethene	156-60-5	TWA 200 ppm	None established	TWA 200 ppm STEL 250 ppm (skin)	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Narcotic. Irritation eyes, skin, respiratory tract, mucous membrane; CNS depression.	Respiratory tract, mucous membrane, eyes, skin, CNS	Colorless liquid with a fruity pleasant odor BP: 48°C Fl.P 6C UEL: 12.8% LEL: 9.7%
Dibenzo[a,h]anthracene	53-70-3	None established	None established	None established	None established	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin	Eyes, skin; skin photosensitization.	Colorless crystalline powder BP: 524°C
Dibenzofuran	132-64-9								
Diesel Fuel #2	68476-34-6	TWA 100 mg/m^3; Skin notation	None established	Designated as an OSHA Select Carcinogen	None established	ingestion, skin and/or eye contact	Kidney damage; potential lung damage; suspected carcinogen; irritation of eyes, skin, respiratory tract; dizziness, headache, nausea; chemical pneumonitis (from aspiration of liquid); dry, red skin; irritant contact dermatitis; eye redness, pain.	Eyes, skin, kidneys	Clear yellow brown combustible liquid; floats on water; distinct diesel petroleum hydrocarbon odor. BP: 356-716°F Fl.P: 154.4-165.2°F LEL: 0.6% UEL: 7.0%
Ethylbenzene	100-41-4	TWA 20 ppm	TWA 100 ppm (435 mg/m^3) STEL 125 ppm (545 mg/m^3)	TWA 100 ppm (435 mg/m^3)	800 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with an aromatic odor. BP: 277°F Fl.P: 55°F UEL: 6.7% LEL: 0.8% Class IB Flammable Liquid
Fluoranthene	206-44-0	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible burns; heart and liver injury, pulmonary edema, respiratory arrest, gastrointestinal disturbances.	Heart, liver, lungs.	Yellow needles.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 2401 Third Avenue & 101 Lincoln Avenue,Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Fuel Oil #2	68476-30-2	TWA 100 mg/m3; Skin notation	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; CNS effects; nausea, vomiting, headache, cramping, dizziness, weakness, loss of coordination,, drowsiness; kidney, liver damage	Eyes, skin, CNS	Clear or yellow to red oily liquid, kerosene-like odor BP: 347 - 689 °F UEL:5-6% LEL: 0.7-1.0%
Gasoline	8006-61-9	TWA 300 ppm STEL 500 ppm	Carcinogen	None established	Ca [IDLH value has not been determined]	Skin absorption; inhalation; ingestion; skin and/or eye contact	Eyes and skin irritation, mucous membrane; dermatitis; headache; listlessness, blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis; possible liver, kidney damage [Potential occupational carcinogen]	Eyes, skin, respiratory system, CNS, Liver, Kidneys	Clear liquid with a characteristic odor, aromatic Fl.Pt. = -45°F LEL = 1.4% UEL = 7.6% Class 1B Flammable Liquid
Hydrogen Sulfide	7783-06-4	TWA 1 ppm STEL 5 ppm	C 10 ppm (15 mg/m^3) [10-minute]	C 20 ppm 50 ppm [10-minute maximum peak]	100 ppm	inhalation, skin and/or eye contact	Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite	Eyes, respiratory system, central nervous system	Colorless gas with a strong odor of rotten eggs. BP: -77°F UEL: 44.0% LEL: 4.0% Flammable Gas
Indeno[1,2,3-cd]pyrene	193-39-5	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible human carcinogen (skin); weakness; affect liver, lung tissue, renal tissue; impairment of blood forming tissue	Skin	Fluorescent green-yellow crystalline solid BP: 536 C
Lead (inorganic)	7439-92-1	TWA 0.05 mg/m^3	TWA (8-hour) 0.050 mg/m^3	TWA 0.050 mg/m^3	100 mg/m^3 (as Pb)	inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid. BP: 3164°F Noncombustible Solid in bulk form
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	TWA 0.01 mg/m^3 STEL 0.03 mg/m^3 [skin]	TWA 0.01 mg/m^3 STEL 0.03 mg/m^3 [skin]	TWA 0.01 mg/m^3 C 0.04 mg/m^3	2 mg/m^3 (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spasticity, jerking limbs; dizziness; salivation; lacrimation (discharge of tears); nausea, vomiting, diarrhea, constipation; skin burns; emotional disturbance; kidney injury; possible teratogenic effects	Eyes, skin, central nervous system, peripheral nervous system, kidneys	Appearance and odor vary depending upon the specific (organo) alkyl mercury compound
Mercury compounds [except (organo) alkyls] (as Hg) Mercury	7439-97-6	TWA 0.025 mg/m^3 (elemental and inorganic forms)	Hg Vapor: TWA 0.05 mg/m^3 [skin] Other: C 0.1 mg/m3 [skin]	TWA 0.1 mg/m^3	10 mg/m^3 (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eyes, skin, respiratory system, central nervous system, kidneys	Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.] BP: 674°F
Methylene Chloride (Dichloromethane)	75-09-2	TWA 50 ppm, A3 - suspected human carcinogen	Ca	TWA 25 ppm STEL 125 ppm	Ca [2300 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]	Eyes, skin, cardiovascular system, central nervous system	Colorless liquid with a chloroform-like odor BP: 104°F UEL: 23% LEL: 13%
Naphtha (Rubber Solvent)	8030-30-6	None established	TWA 100 ppm (400 mg/m^3)	TWA 100 ppm (400 mg/m^3)	1000 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; dizziness, drowsiness; dermatitis; in animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Reddish-brown, mobile liquid with an aromatic odor BP: 320-428°F Fl.P: 100-109°F Class II Combustible Liquid
Naphthalene	91-20-3	TWA 10 ppm [skin]	TWA 10 ppm (50 mg/m^3) STEL 15 ppm (75 mg/m^3)	TWA 10 ppm (50 mg/m^3)	250 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	Colorless to brown solid with an odor of mothballs. BP: 424°F Fl.P: 174°F UEL: 5.9% LEL: 0.9%
Petroleum hydrocarbons(Petroleum distillates)	8002-05-9	None established	TWA 350 mg/m^3 C 1800 mg/m^3 [15 min]	TWA 500 ppm (2000 mg/m^3)	1,100 [10% LEL]	Inhalation; ingestion; skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, drowsiness, headache, nausea; dried/cracked skin; chemical pneumonitis	CNS, eyes, respiratory system, skin	Colorless liquid with a gasoline or kerosene-like odor BP: 86-460°F Fl. Pt = -40 to -86°F UEL: 5.9% LEL: 1.1% Flammable liquid
Polychlorinated Biphenyls (PCBs) (Chlorodiphenyl (42% Chlorine))	53469-21-9	TWA 1 mg/m^3	Ca TWA 0.001 mg/m^3	0.5 mg/m^3	5 ppm	Dermal; inhalation; ingestion; skin and/or eye contact	Irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Eyes, skin, liver, respiratory system	Colorless to light-colored, viscous liquid, hydrocarbon odor, BP: 617 - 734°F, non-flammable, LEL: NA, UEL: NA
Selenium	7782-49-2	TWA 0.2 mg/m^3	TWA 0.2 mg/m^3	TWA 0.2 mg/m^3	1 mg/m^3 (as Se)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.] BP: 1265°F

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 2401 Third Avenue & 101 Lincoln Avenue,Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Silver	7440-22-4 (metal)	TWA 0.1 mg/m^3 (metal, dust, fume) TWA 0.01 mg/m^3 (Soluble compounds, as Ag)	TWA 0.01 mg/m^3	TWA 0.01 mg/m^3	10 mg/m^3 (as Ag)	inhalation, ingestion, skin and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Nasal septum, skin, eyes	Metal: White, lustrous solid BP: 3632°F
Tetrachloroethene	127-18-4	TWA 25 ppm STEL 100 ppm listed as A3, animal carcinogen	Ca Minimize workplace exposure concentrations	TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm	Ca [150 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a mild, chloroform-like odor. BP: 250°F Noncombustible Liquid
Toluene	108-88-3	TWA 20 ppm	TWA 100 ppm (375 mg/m^3) STEL 150 ppm (560 mg/m^3)	TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)	500 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, pungent, benzene-like odor. BP: 232°F Fl.P: 40°F UEL: 7.1% LEL: 1.1% Class IB Flammable Liquid
1,1,1-Trichloroethane (Methyl Chloroform)	71-55-6	TWA 350 ppm STEL 450 ppm	C 350 ppm (1900 mg/m^3) [15-minute]	TWA 350 ppm (1900 mg/m^3)	700 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eyes, skin, central nervous system, cardiovascular system, liver	Colorless liquid with a mild, chloroform-like odor. BP: 165°F UEL: 12.5% LEL: 7.5%
Trichloroethene	79-01-6	TWA 10 ppm STEL 25 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)	Ca [1000 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	Colorless liquid (unless dyed blue) with a chloroform-like odor. BP: 189°F UEL(77°F): 10.5% LEL(77°F): 8%
Vinyl Chloride	75-01-4	TWA 1 ppm	Carcinogen	TWA 1 ppm C 5 ppm [15-minute]	Ca [IDLH value has not been determined]	inhalation, skin, and/or eye contact (liquid)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. BP: 7°F UEL: 33.0% LEL: 3.6% Flammable Gas
Xylene (m, o & p isomers)	108-38-3, 95-47-6, 106-42-3	TWA 100 ppm STEL 150 ppm	TWA 100 ppm (435 mg/m^3)	TWA 100 ppm (435 mg/m^3)	900 ppm	Skin absorption, inhalation, ingestion, skin, and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 282°F, 292°F, 281°F Fl. Pt. 82°F, 90°F, 81°F LEL: 1.1%, 0.9%, 1.1% UEL: 7.0%, 6.7%, 7.0% Class C Flammable Liquid
Zinc Oxide	1314-13-2	TWA 2 mg/m3 STEL 10 mg/m^3	None established	TWA 10 mg/m3 (for zinc oxide fume)	None established	skin and/or eye contact, inhalation, ingestion	Irritation eyes, skin, respiratory tract; gastrointestinal disturbances	Eyes, skin, respiratory system,	Bluish gray solid BP: 1664.6°F Flammable

References

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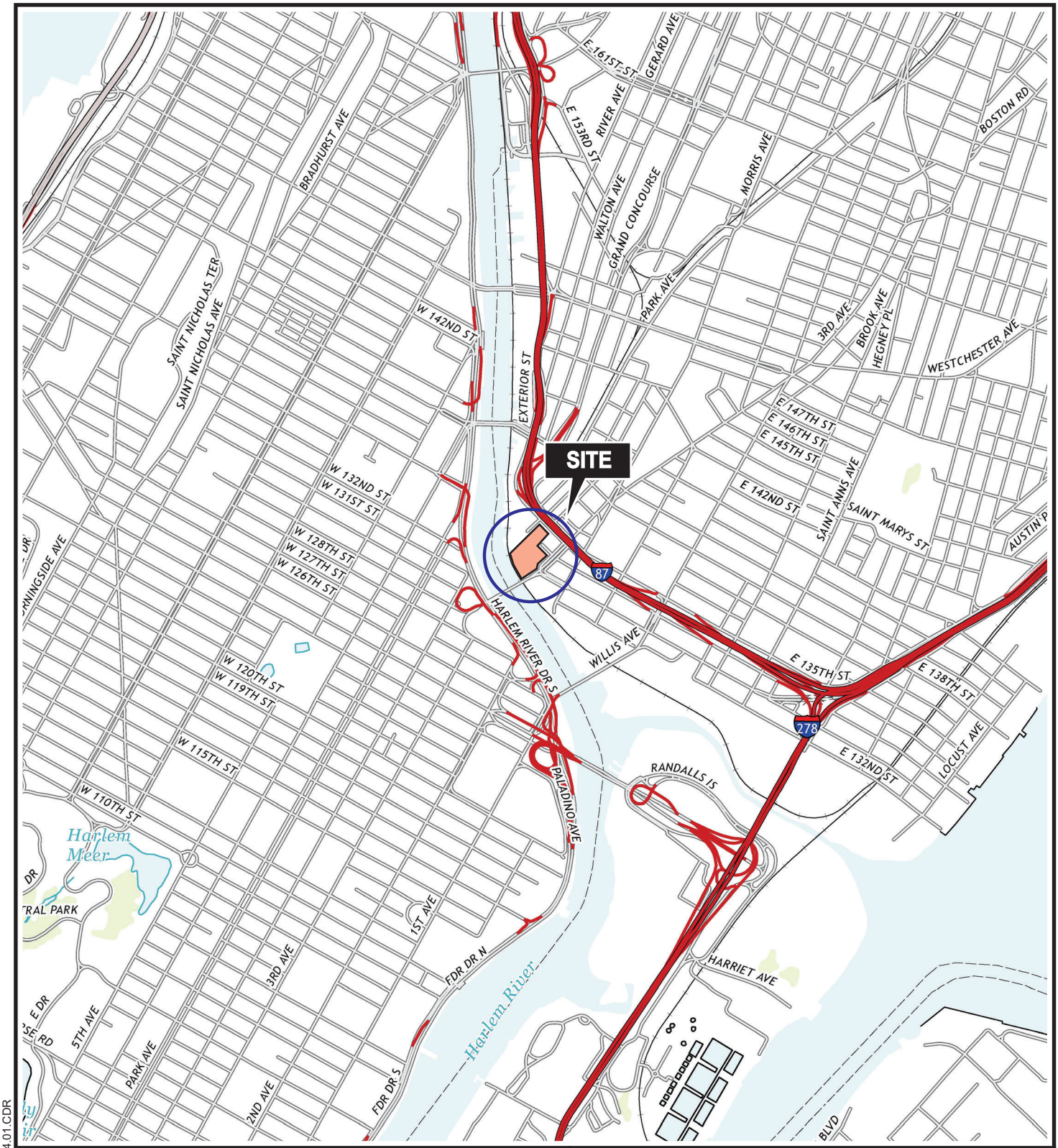
Proctor, N.H., J.P. Hughes and M.L. Fischman, 1989. Chemical Hazards of the Workplace. Van Nostrand Reinhold. New York.
Sax, N.I. and R.J. Lewis. 1989. Dangerous Properties of Industrial Materials. 7th Edition. Van Nostrand Reinhold. New York.
2017 TLVs® and BEIs®, American Conference of Industrial Hygienists

Abbreviations:

ACGIH – American Conference of Governmental Industrial Hygienists.
BP – boiling point at 1 atmosphere, °F
C – Ceiling, is a concentration that should not be exceeded during and part of the working exposure.
CAS# - Chemical Abstracts Service registry number which is unique for each chemical.
Ft Pt. – Flash point
IDLH - Immediately Dangerous to Life and Health concentrations represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
LEL – Lower explosive (flammable) limit in air, % by volume (at room temperature)
mg/m^3 – Milligrams of substance per cubic meter of air
NIOSH - National Institute for Occupational Safety and Health.
OSHA – Occupational Safety and Health Administration
PEL - OSHA Permissible Exposure Limit (usually) a time weighted average concentration that must not be exceeded during any 8 hour work shift of a 40 hr work week.
ppm – parts per million
REL – NIOSH Recommended Limit indicated a time weighted average concentration that must not be exceeded during any 10 hour work shift of a 40 hr work week
SG - Specific Gravity
STEL – Short-term exposure limit (ST)
TLV - ACGIH Threshold Limit Values (usually 8 hour time weighted average concentrations).
TWA – 8-hour, time-weighted average
UEL – Upper explosive (flammable) limit in air, % by volume (at room temperature)
VP - Vapor Pressure

FIGURES

1. Site Location Map
2. Site Plan
3. Route to Hospital and Urgent Care Facility



QUADRANGLE LOCATION

SOURCE:
USGS; 2013, Central Park, NY
7.5 Minute Topographic Quadrangle

N

0 2000’

Title:

SITE LOCATION MAP

Prepared for:

BOP 2401 THIRD AVENUE, LLC

ROUX

Compiled by: J.M.	Date: 14NOV18
Prepared by: G.M.	Scale: AS SHOWN
Project Mgr: L.D.	Project: 3171.0001Y000
File: 3171.0001Y104.01.CDR	

FIGURE 1

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LEGEND

- SITE BOUNDARY
- SITE ENTRANCE/EXIT
- MUSTER AREA

N

60’ 0 60’

Title:

SITE PLAN

Prepared for:

BOP 2401 THIRD AVENUE, LLC

ROUX

Compiled by: J.M.	Date: 14NOV18	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	2
Project Mgr: L.D.	Project: 3171.0001Y000	
File: 3171.0001Y104.03.DWG		

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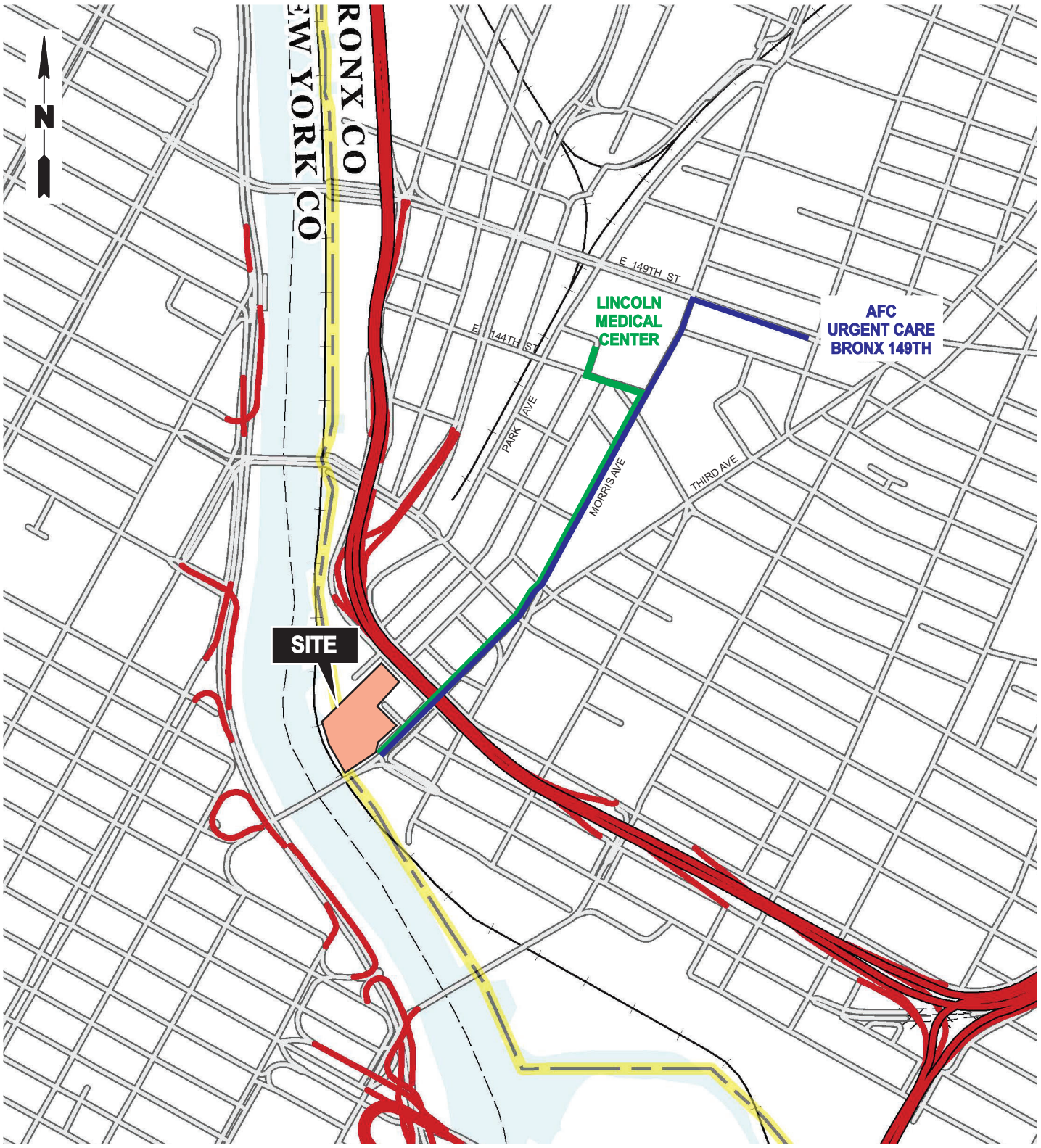

LINCOLN MEDICAL CENTER
234 E 149TH ST., BRONX, NY 10451
HOSPITAL PHONE #: (718) 579-5000

- HEAD NORTHWEST TOWARDS E 135TH ST.
- TURN RIGHT ON E 135TH ST.
- TURN LEFT ONTO LINCOLN AVE.
- CONTINUE STRAIGHT TO THIRD AVE.
- CONTINUE ONTO MORRIS AVE.
- TURN LEFT

HOSPITAL ENTRANCE WILL BE ON RIGHT

AFC URGENT CARE BRONX 149TH
332 E 149TH ST., BRONX, NY 10451
URGENT CARE PHONE #: (347) 751-6740

- HEAD NORTHWEST TOWARDS E 135TH ST.
- TURN RIGHT ON E 135TH ST.
- TURN LEFT ONTO LINCOLN AVE.
- CONTINUE STRAIGHT TO THIRD AVE.
- CONTINUE ONTO MORRIS AVE.
- TURN RIGHT ONTO E 149TH ST.

URGENT CARE ENTRANCE WILL BE ON RIGHT

0 1000'

Title:

ROUTE TO HOSPITAL AND URGENT CARE

Prepared for:

BOP 2401 THIRD AVENUE, LLC

ROUX

Compiled by: J.M.	Date: 14NOV18
Prepared by: G.M.	Scale: AS SHOWN
Project Mgr: L.D.	Project: 3171.0001Y000
File: 3171.0001Y104.01.CDR	

FIGURE 3

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APPENDICES

A. Job Safety Analysis (JSA) Forms
B. SDSs for Chemicals Used
C. Personal Protective Equipment (PPE) Management Program
D. Generic Community Air Monitoring Plan (CAMP)
E. Safety Meeting Log
F. Subsurface Utility Clearance Management Program
G. Heavy Equipment Exclusion Zone Management Program
H. Roux COVID-19 Interim Health and Safety Guidance
I. CDC's Face Covering Procedure

APPENDIX A

Job Safety Analysis (JSA) Forms

JOB SAFETY ANALYSIS	Cntrl. No.	DATE:	☒ NEW ☐ REVISED	PAGE 1 of 2
JSA TYPE CATEGORY **GENERIC**	WORK TYPE	WORK ACTIVITY (Description)		

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☐ GLOVES:
☐ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☐ PPE CLOTHING:	
☐ SAFETY GLASSES	☐ SAFETY SHOES		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment:

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE: A _ foot exclusion zone will be maintained around (indicate equipment).

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. [INSERT JOB STEP]	**1a. CONTACT:** [INSERT HAZARD]	1a.
	1b. CAUGHT: [INSERT HAZARD]	1b.
	1c. FALL: [INSERT HAZARD]	1c.
	1d. EXPOSURE: [INSERT HAZARD]	1d.
	1e. EXERTION: [INSERT HAZARD]	1e.
	1f. ENERGY SOURCE: [INSERT HAZARD]	1f.
2. [INSERT JOB STEP]	**2a. CONTACT:** [INSERT HAZARD]	2a.
	2b. CAUGHT: [INSERT HAZARD]	2b.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

	2c. FALL: [INSERT HAZARD]	2c.
	2d. EXPOSURE: [INSERT HAZARD]	2d.
	2e. EXERTION: [INSERT HAZARD]	2e.
	2f. ENERGY SOURCE: [INSERT HAZARD]	2f.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-009	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 1

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**O&M**	**Movement of 55-Gallon Drums/Drum Handling with Mobile Carrier**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Michael Sarni	Technician	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant gloves
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER:
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent long sleeve shirt or long sleeve shirt and reflective safety vest.	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel or composite toe		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Mobile Drum Carrier, safety cones, and caution tape

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around heavy equipment (i.e. forklift).

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Preparing for and Inspection of Drum	**1a. FALL:** Tripping/falling due to uneven surface. Loose debris/garbage in work area.	1a. Clear area of loose garbage and debris. Inspect 55-gal drums for proper condition, labeling, check drum ring and bolts for tightness, inspect mobile drum carrier. 1a. Do a Test Lift to get a general sense of the weight of the drum. 1a. Inspect and use established pathways to avoid uneven terrain, weather-related hazards (i.e., debris, puddles, ice, etc.), and other obstructions. 1a. Secure work area and coordinate and communicate the planned work activities with other personnel working in the area. 1a. Delineate work area with 42" safety cones.
	1b. CONTACT/EXPOSURE: Drums could potentially be damaged or contain hazardous material. Mobile drum carrier could potentially be in poor working condition causing malfunctioning during operation.	1b. Prior to inspecting drums don cut-resistant gloves. If drum is not properly labeled, do not open and cease all drum transport activities. Immediately contact project manager and inform him/her of drum situation. 1b. Do not continue drum transport activities until further actions are determined by the project manager. 1b. If the drum is properly labeled, but leaking, improperly sealed or in poor condition, place drum in an over-pack drum. 1b. Inspect mobile drum carrier to ensure its overall integrity. Look for rust marks or potential weak points where the drum carrier could malfunction. Inspect the wheels to ensure that they easily turn and nothing is impeding their movement.
	1c. EXERTION/CAUGHT: Potential pinching/exertion hazards while securing ring/ tightening bolts	1c. Keep back straight and knees slightly bent while securing drum ring/tightening bolt. Wear cut-resistant gloves.
2. Position drum clamp tightly in between drum ribs, securing drum clamp to drum with chain	**2a. CAUGHT:** Pinching fingers between drum clamp and handle/chain.	2a. Attach drum clamp with chain and tighten until snug. Do not place hands between drum clamp and drum as the chain is tightened; wear cut resistant gloves. Keep face away from drum when handling in case of escaping vapors.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Disengage safety latches on handle, pull handle down until drum is lifted off ground and safety latches are reengaged; slightly suspending drum off the ground	**3a. EXERTION/ CONTACT:** Potential muscle strain associated with lifting/engaging drum/handle. Drum could shift/slip downward and crush toes.	3a. Ascertain whether the drum is overweight; if it is, then two people are needed to lower handle while drum is secured with clamp so that safety latches can be engaged. Keep body out of the line of fire of the handle (do not position head above handle) as it is being pushed down. Do not allow feet/toes to be positioned under the drum as it is being lifted; wear steel/composite toe boots.
	3b. CAUGHT: Fingers could be pinched while engaging/disengaging safety latches on handle	3b. Wear cut-resistant gloves while disengaging/reengaging safety latches. 3b. Avoid placing hands in pinch points.
4. Transport drums to designated location and disengage drum clamp (repeat Step 3 in reverse order)	**4a. FALL:** Tripping/ falling due to obstructions and uneven terrain. Potential for drum to fall during transport.	4a. Ensure transport path is free of potential obstructions that may cause the drum/carrier to become unstable. Position drum clamp between the ribs on the drum to prevent possible slipping.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

JOB SAFETY ANALYSIS	Ctrl. No. GEN-015	DATE: 1/4/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)	
GENERIC	**Site Recon**	**Mobilization/Demobilization**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Rebecca Lowy	Staff Assistant Geologist	Brian Hobbs	Senior Health & Safety Manager
Tally Sodre	OHSM	Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION (as needed) ☒ SAFETY SHOES: Steel Toe or composite toe	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest of high-visibility clothing; long sleeve shirt; long pants	☒ GLOVES: Leather, nitrile, and cut resistant (as needed) ☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: None

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around equipment in use..

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilize/demobilize and establish work area	**1a. FALL:** Slip/trips/falls from obstructions, uneven terrain, weather conditions, heavy loads, and/or poor housekeeping.	1a. Use 3 points-of-contact/ensure secure footing when entering and exiting vehicle. 1a. Inspect walking path for uneven terrain, steep hills, obstructions, and/or weather-related hazards (i.e., ice, snow, and puddles) prior to mobilizing equipment. Use established pathways. Walk on stable/secure ground. 1a. Do not climb over stored materials/equipment; walk around. Practice good housekeeping; organize and store equipment neatly in one area at its lowest potential energy. 1a. Wear boots with adequate treads. 1a. Delineate unsafe areas with 42” cones, caution tape and/or flagging.
	1b. CONTACT: Personal injury and/or property damage caused by being struck by Site traffic or equipment used in Site activities.	1b. Observe and maintain the posted speed limits. 1b. When first arriving onsite, park vehicles in designated parking space and/or out of the way locations. Use parking brake on all vehicles and tire chocks on work trucks and trailers. 1b. Check in with Site Manager/Supervisor to ensure coordination with other Site activities and to discuss any special hazards. Ensure that short-service employees (SSE) are identified. 1b. Identify potential traffic sources. 1b. Wear PPE including high visibility clothing or reflective vest. 1b. Use a spotter while moving work vehicles; plan ahead to avoid backing whenever possible. 1b. Maintain a minimum 10’ exclusion zone when vehicles are in motion. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver-to-spotter visibility. 1b. Delineate work area with 42” cones, flags, caution tape, and/or other barriers. 1b. Position “Work Area” signs at Site entrances, if possible, or at either side of work area.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
		1b. Position largest vehicle to protect against oncoming traffic. 1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route. 1b. Observe potential overhead and ground surface features that may interfere with moving equipment. Clear the path of physical hazards prior to initiating mobilization.
	1c. CAUGHT: Personal injury from pinch points and being in line-of-fire of vehicle and/or equipment.	1c. Make sure driver has engaged parking brake and placed wheel chocks in a position to prevent movement. Be sure that vehicle is parked in front/down gradient (positioned to best block oncoming traffic) of work area. 1c. Wear leather gloves when handling any tools or equipment. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects/cutting tools/glass. 1c. Keep body parts away from line-of-fire of equipment. 1c. Always carry tools by the handles and/or designated carrier. Ensure sharp-edged tools are sheathed/secure. 1c. Remove any loose jewelry. Avoid wearing loose clothing and/or ensure loose clothing is secure. 1c. Secure all items on the equipment, tighten up any items or features that have potential to shift or break during mobilization.
	1d. OVEREXERTION: Muscle strains while lifting/carrying equipment.	1d. Use body positioning and lifting techniques that avoid muscle strain; keep back straight, lift with legs, turn with whole body, keep load close to body, and never reach with a load. 1d. Ensure that loads are balanced. Use assistance (mechanical or additional person) to carry equipment that is either unwieldy or over 50 lbs.
	1e. EXPOSURE: Personal injury from exposure to biological and environmental hazards.	1e. Inspect area to avoid contact with biological hazards (i.e. poisonous plants, stinging insects, ticks, etc.). 1e. Wear long sleeved clothes treated with Permethrin, apply insect repellant containing DEET to exposed skin, and inspect clothes and skin for ticks during and after work. 1e. Apply sunscreen (SPF 15+) if exposure to sun for 30 minutes or more is expected.
	1f. EXPOSURE: Weather related injuries.	1f. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, nausea, rapid and shallow breathing). Take breaks in cool places and hydrate as needed. 1f. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks in warm areas as needed. 1f. Wear clothing appropriate for weather and temperature conditions (e.g., rain jackets, snow pants, multiple layers). 1f. If lightning is observed, wait 30 minutes in a sheltered location (car is acceptable) before resuming work.
	1g. EXPOSURE: Personal injury from noise hazards.	1g. Wear hearing protection if sound levels exceed 85 dBA (if you must raise your voice for normal conversation).

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JOB SAFETYANALYSIS Ctrl. No. GEN-020	DATE: 1/4/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY: **GENERIC**	WORK TYPE: **Gauging & Sampling**	WORK ACTIVITY (Description): **Soil Sampling**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
MaryBeth Lyons	Project Scientist	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health and Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES ☒ FLAME RESISTANT CLOTHING (as needed)	☐ GOGGLES ☐ FACE SHIELD: ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Recommended Equipment: 42" traffic cones, caution tape, trowel

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around moving equipment, if present.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure location	**1a. CONTACT:** Personnel and vehicular traffic may enter the work area.	1a. If in an area with foot or vehicle traffic, delineate the work area with 42" traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity. 1a. Wear reflective vest and/or high visibility clothing. 1a. Face the direction of any vehicular traffic. Position vehicle to protect worker from traffic. 1a. Communicate work activity with adjacent work areas.
	1b. FALL: Tripping/falling due to uneven terrain or entry/exit from excavations.	1b. Inspect pathways and work area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions. 1b. Use established pathways and walk on stable, secure ground. 1b. Stage equipment and tools in a convenient, stable, and orderly manner. Store equipment at lowest potential energy. 1b. Roux employees should stay 5 feet from in-progress excavations and trenches. Should entry to an excavation be required (when stabilization is complete), ladders must be employed for steep embankments, excavations, pits, and trenches.
	1c. EXPOSURE: Exposure to sun and excessive heat, possibly causing sunburn, heat exhaustion or heat stroke. Exposure to cold temperatures possibly causing cold stress. Skin burn as a result of fire, if applicable. Exposure to explosive vapors due to tank farm operations. Exposure to airborne dust due to high wind speeds. Biological hazards - ticks, bees/wasps, poison ivy, thorns, insects, etc.	1c. Wear sunscreen with an SPF 15 or greater whenever 30 minutes or more of exposure is expected. 1c. Use a tent to shade the work area from direct sunlight particularly when warm temperatures are expected. 1c. Be aware of the location of all Site personnel. 1c. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). 1c. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). 1c. Take breaks for rest and water as necessary. Move to an area that is well shaded or a climate controlled area (i.e., car, site trailer, etc.). 1c. No open flames/heat sources. 1c. Flame retardant clothing must be worn when specified by Site policy. 1c. Cell phones should be disabled when specified by Site policy. 1c. Pre-treat field clothing with Permethrin prior to site visit to kill ticks and insects. 1c. Wear long sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin. 1c. Spray insect repellant containing DEET on exposed skin when working in overgrown areas of the Site. 1c. Inspect area to avoid contact with biological hazards. 1c. Wear cut-resistant gloves when handling branches, shrubs, etc. that may lie within the walking path. 1c. Wear spoggles if the average wind speeds are above 15 mph. 1c. Personnel shall examine themselves and co-worker's outer clothing for ticks periodically when onsite. 1c. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water. If rash persists after washing, immediately notify your supervisor, the OM and OHSM for possible consultation with a physician at an approved Occupational Health Clinic.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Collect Soil Sample	**2a. CONTACT:** Personal injury from pinch points, cuts, and abrasions from sampling equipment tools, and material within soil sample. Personal injury from contact with moving equipment while sampling. Personal injury from contact with glass sample jars.	2a. Wear cut-resistant (i.e., Kevlar) gloves under chemical-resistant (nitrile) disposable gloves when handling soil samples and sampling jars. 2a. Where possible, use trowel or equivalent tool to avoid contact with soil. 2a. If sampling from bucket of heavy equipment, ensure all equipment is off and operator utilizes the “show me your hands” policy. 2a. See 1a.
	2b. EXPOSURE: Exposure to contamination (impacted soil) and/or lab preservatives.	2b. Wear chemical-resistant (nitrile) disposable gloves over cut resistant gloves to protect hands when handling samples; use containment material or plastic sheeting to protect surrounding areas. 2b. Wear safety glasses to protect eyes from dust or air-borne contaminants that may results from disturbing the soil. 2b. Where possible, remain upgradient from sample location if collecting soil sample from stockpile, drill rig, etc. to avoid breathing contaminant vapors, if they are present. 2b. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 2b. Open sample jars slowly and fill carefully to avoid contact with preservatives.
	2c. EXERTION: Exertion due to repetitive motion and ergonomics.	2c. Utilize a table or raised surface for soil sampling if multiple soil samples are going to be taken to minimize repetitive bending motion.
3. Decontaminate equipment	**3a. EXPOSURE/CONTACT:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated vapors and/or soil). **3b. EXPOSURE:** Chemicals in cleaning solution including ammonia.	3a. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3a. Use an absorbent pad to clean spills. 3a. Properly dispose of used materials/PPE in provided drums in designated drum storage area. 3a. Remain upwind of sample and avoid breathing contaminant vapors, if they are present. 3b. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3b. Work on the upwind side of decontamination area. 3b. Use an absorbent pad to clean spills. 3b. Properly dispose of used materials/PPE in provided drums in designated drum storage area. Ensure that all drums are properly labeled and secured.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-003	DATE 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2
JSA TYPE CATEGORY **GENERIC**	WORK TYPE **Construction - Excavation**	WORK ACTIVITY (Description) **Backfilling Excavation & Compaction**		

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Project Engineer	Brian Hobbs	Corporate Health & Safety Manager
Edward Lacina	Senior Construction Manager		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather/ cut-resistant level 2
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER _____
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: reflective DOT approved safety	
☒ SAFETY GLASSES	☒ SAFETY TOE BOOTS		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Payloader, Backhoe, Dump Trucks, Mechanical gas powered tampers, Excavator with hydraulic tamper. APR when tamping if dust present. Two-way radios.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE: A 10' minimum exclusion zone will be maintained around excavator, backhoe, tampers, and dump trucks.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Pre-construction meeting: Review proposed excavation locations	**1a. CONTACT:** Potential for contact with subsurface utilities and above ground utilities	1a. Call state 811 for mark out service and one call ticket. 1a. Obtain private utility mark out service as necessary. 1a. Review and mark proposed excavations w/white paint. 1a. Identify all "Critical" zones. A Critical zone is any area within 10 feet of any operating utility. 1a. **Complete subsurface clearance checklist.** 1a. Soft dig must be conducted within 2 lateral feet of any suspected underground utility. 1a. Protection of aboveground utilities identified as being located within the work zone must be coordinated w/ client and utility owner.
2. Secure Work Area	**2a. CONTACT:** Potential for personnel to enter the work area. Potential for equipment to contact, or crush personnel. **2b. EXERTION:** Potential for muscle strain or tear while installing traffic cones and barrel	2a. Ensure work area is secure and inform others of work activity. Establish a heavy equipment exclusion zone (HEEZ) using 42" traffic cones, barrels & snow fencing or telescoping poles. Use of flag persons to maintain clear traffic and to minimize motorist confusion during set-up of new traffic pattern. HEEZ to include tip/swing radius of equipment. 2a. Dump Truck/Excavator/Payloader/Backhoe equipment to be set-up by personnel who are familiar with machinery. Spotters shall be in place for all equipment. and to control access to the HEEZ 2a. Truck wheels are chocked when driver is not in truck and engine shut off. 2a. Personnel shall stay out of the exclusion zone (10' minimum or greater than the equipment boom) while equipment is maneuvering. 2b. Keep back straight, keep load close to the body and bend knees while lifting and working. If over 50 lbs., use 2 or more laborers for lifting or use of equipment.

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3. Backfilling excavation, and compaction	**3a. CONTACT:** Traffic and live equipment. .	3a. Equipment and trucks shall be isolated from other workers, subcontractors and third party traffic with 42" traffic cones, barricades, snow fencing or telescoping poles, and/or Jersey barriers. Spotters shall direct dump truck for placement of fill near excavation. Pay loader/ Excavator, as directed by spotter, shall move fill into trench where it shall be placed in layers and compacted by mechanical means. 3a. Spotters will wear florescent vests at all times. 3a. Spotters will remain out of the exclusion zone, line of fire from equipment and third-party vehicles. 3a. Spotters and operators will have radios for communication, when other visual and/or hand signals are insufficient. 3a. Locate all overhead utilities. All personnel and machinery should maintain a 10' distance from overhead electric lines. Refer to OSHA chart for distances and voltage. 3a. For excavations engineered (shored, sloped, benched} all personnel, equipment, and materials must remain a minimum of 2 feet from edge of excavation.
	3b. EXPOSURE: Fumes from gas powered tamper	3b. Fueling of all equipment will be done outside of work area in a well-ventilated area. Refueling will be done only after a 2-5-minute cool down.
	3c. FALL: Slips, trips, fall hazards.	3c. Work area will be clean and free of any debris to remove slip, trip and fall hazards. All tools will be kept in designated areas. Insure work area is well illuminated. 3c. Workers should only be working in areas that have been leveled with a machine. 3c. All persons working at elevations over 6' shall use a guardrail system or personal fall arrest system while around excavation.
	3d. OVEREXERTION: Muscle strain, or tear.	3d. Keep knees bent and back straight while transferring/ lifting/lowering tamper from elevated areas. Utilize a co-worker to avoid staining muscles. 3d. Keep knees bent and back straight while maneuvering tamper. Utilize a co-worker to avoid staining muscles.
	3e. EXPOSURE: Noise from tamper. Dust inhalation.	3e. Workers will wear hearing protection during compaction tamper activities. 3e. Wear NIOSH approved dust mask for personal comfort. If dust is visible for extended time, limit by wetting down area. 3e. If dust continues stop work and evaluate if APR is needed with approval and clearance.
4. Secure/leave site.	**4a. FALL:** Slip, trip, fall	4a. Clear work area of all debris and store all equipment in designated areas/containers before opening to traffic. 4a. Replace fencing and barricades as needed to secure path before opening roadway or area up to traffic(vehicle, pedestrian and/or bicycle).

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-004	DATE 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2
JSA TYPE CATEGORY **GENERIC**	WORK TYPE **Construction - Concrete and Asphalt**	WORK ACTIVITY (Description) **Concrete Form Assembly and Concrete Pouring**		

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Project Engineer	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☒ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut resistant and Nitrile/Latex
☒ HARD HAT	☒ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☒ OTHER: Chaps, dust mask
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: reflective DOT approved safety	
☒ SAFETY GLASSES	☒ SAFETY TOE BOOTS: Steel /composite toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Wheel Barrow, Trowels, Concrete Floats and Hand Tools (Extension Poles), Waterproof Boot Covers, Traffic Cones, Caution Tape, Portable Eye Wash Station

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE: A 10' minimum exclusion zone will be maintained around equipment and loads while it is in motion.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Set-up work zone	**1a. CONTACT:** Moving equipment, third party traffic.	1a. Secure work area using barricades/barrels/cones and caution tape/safety fence. Use flagmen to control third party traffic. **Maintain minimum exclusion zone (EZ) of 10'** around equipment and live loads. 1a. When machines are operating, all workers will remain outside of EZ unless operator is in "HANDS OFF" mode.
2. Assembly of concrete forms (i.e. plywood, lumber, rebar, etc.)	**2a. CONTACT:** Contacting materials being lowered into work area. Potential for cuts and abrasions and to be contacted by nails while assembling. **2b. EXERTION:** Muscle strain. **2c. EXPOSURE:** Noise, dust, fumes. **2d. CAUGHT:** Pinch points, caught between, Crushed	2a. Workers will keep fingers and limbs out of the line of fire of tools, equipment and live loads. Workers will use inspected rigging and only attach rigging to manufacturer installed lifting points. Loads will be controlled with non-conductive tag lines from outside the EZ. Wear hard hat. See JSA for applicable cutting tool. 2b. When transporting and working with forms, workers will keep backs straight, knees bent, and loads close to their body. Any load more than 50 lbs., will be lifted by two or more workers or a mechanical lifting device. 2c. Workers will wear hearing protection, face shields and chaps when using all power tools. Fuel powered tools will be fueled away from the work zone in a well-ventilated area. Refueling will be done after a minimum cool down period of 5 minutes. See JSA for applicable cutting tool. 2d. Keep hands away from rigging while hooking/unhooking materials; wear cut resistant gloves.
3. Setup concrete trucks and chute	**3a. CONTACT/CAUGHT:** Potential for truck to contact personnel, fingers to be pinched while setting up chutes. Contact with overhead power lines. **3b. OVEREXERTION:** Strain, pulled muscles.	3a. Spotters will guide concrete trucks into position; wheel chocks will be set before work begins when trucks are parked. Workers will stay out of exclusion zone until truck is parked and secured. Keep hands clear of potential pinch points when assembling chutes. 3a. A minimum clearance of 10 feet shall be maintained from all overhead power lines. That distance may be reduced if shielding is in place or it is determined that lines are low voltage. 3b. All workers will keep back straight and bend their knees when lifting. Two workers will be used when load exceeds 50 lbs.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
4. Pour concrete into forms	**4a. CONTACT:** Splashing from wet concrete.	4a. Portable eye wash stations shall be set up nearby for easy access; wear safety glasses. Nitrile or latex gloves and water proof boots or boot covers shall be worn to eliminate skin contact with concrete. Any concrete splashed onto non-waterproof clothing shall be removed to avoid skin irritation.
	4b. EXPOSURE: Concrete dust.	4b. Stand upwind while mixing dry concrete. Use dust mask or air purifying respirator to avoid silica inhalation.
5. Concrete finishing work with hand tools and/or vibrate to settle and remove air from poured cement,	**5a. ENERGY SOURCE:** Potential for personnel to be exposed to live electricity.	5a. Electrical tools shall be inspected for defects prior to being used. Any extension cords shall be heavy duty rated and be free from defects (no exposed wires). All electrical connections shall be connected to GFCI outlets. Generators shall be run in well ventilated locations.
	5b. OVEREXERTION: Potential muscle strain while vibrating cement, stepping over forms/rebar reinforcements.	5b. Constantly check/observe where you are walking; wear steel toed boots. Keep back straight and knees bent while settling concrete with vibrator.
	During use of hand tools to finish concrete, worker can overextend to reach far end of poured area.	5b. If worker needs to reach the far end of a poured area with finishing tools, they shall use extension poles and not over reach to maintain balance. Maintain even footing while using finishing tools. Use spotter during extension pole use.
	5c. CONTACT: Potential hand tools with extension poles/handles to contact nearby workers/pedestrians/vehicles/overhead power lines.	5c. During use of hand tools to finish poured concrete workers will alert work crew. If utilizing extension poles/handles worker will use a spotter to make sure no contact is made with other workers, pedestrians, vehicles or overhead power lines.
6. Cleanup of work area and tools.	**6a. CONTACT/FALL:** Potential slip, trip, and fall on materials and tools left in the work area.	6a. Place additional materials and tools in designated storage areas. Remove any garbage from the work area.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-005	DATE 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Construction**	**Cutting with Gas-powered Saw, Sawzall or Plasma Cutter**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Ray Greenidge	Office Health and Safety Manager	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☒ REFLECTIVE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☒ FACE SHIELD (gas powered saw and plasma cutter) ☒ HEARING PROTECTION ☒ SAFETY SHOES: Steel-toed boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent Long sleeved shirt and / or reflective safety vest	☒ GLOVES: Cut-resistant, leather, nitrile ☒ OTHER: Chaps for gas powered saw. Welding suit for plasma cutting.

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Sawzall/extension cord

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Set up/ Secure work area.	**1a. CONTACT:** Personnel could enter the work area	1a. Establish the work zone using 42" cones, caution tape, or fixed rigid barrier. Inform others of work activity.
2. Precutting procedure.	**2a. CONTACT:** Improper blade, malfunctioning guards, unsecured materials, flying debris	2a. Inspect all equipment for defects, replace or service if not functioning optimally. Check that all guards are working and in place, replace if missing. Ensure that blades are sharp and clean to avoid binding and/or burning. Cut on flat/secure work surfaces. Do not cut badly warped wood or boards with knots or nails. 2a. Unplug saw before handing it off to another person. 2a. Wear safety glasses, long-sleeved shirt and leather gloves. Utilize job specific PPE such as welding jacket or chaps when using gas powered saw or a plasma cutter.
	2b. EXPOSURE: Loud noises, dust, bright UV light	2b. When using gas powered saw, wet down area to be cut prior to cutting if high dust levels are anticipated. 2b. Wear hearing protection. Wear a dust mask if large amounts of dust are expected; cut upwind if possible. 2b. When plasma cutting, wear a face shield with shaded glasses rated to block UV light generated by the plasma cutter.
	2c. ENERGY SOURCE: Potential for electric shock	2c. Inspect extension cord for damage. If damaged, tag out and repair / replace. Do not operate saw while standing in water. Ensure GFCI protection at outlet or via attachment. 2c. Ensure all electrical equipment is rated for the task.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Saw Cutting.	**3a. CONTACT:** Fingers could be cut, lacerated or amputated by reciprocating blade; also flying debris and sparks	3a. Cut away from body. Keep fingers away from moving blade. No loose clothing. Never leave saw running unattended. Unplug saw before changing blades or making adjustments / repairs. Set-up barrier to contain sparks. Cut on flat/secure work surfaces. 3a. Wear Safety glasses 3a. Ensure that the saw blade stops rotating/reciprocating before placing saw on the ground.
	3b. CONTACT: Amputation and line of fire injury.	3b. Maintain a minimum 15-foot exclusion zone and ensure that operator and other personnel are kept out of the line-of- fire of the equipment.
	3c. FALL: Tripping hazards caused by cutting/grinding debris, extension cords.	3c. Keep debris generated in designated storage containers. Keep work area free of Slip, Trip and Fall hazards. 3c. Do not route extension cords through walking/working path.
	3d. EXERTION/ERGONOMICS: Lifting heavy or awkward materials may cause muscle strain.	3d. Maintain Proper Body Position while operating lifting and moving with equipment. Keep load close to body, knees bent, and back straight. 3d. Take frequent breaks or switch personnel if cutting for an extended period of time.
	3e. EXPOSURE: Personnel may be exposed to fire hazard during Hot Work Activities.	3e. Complete Hot Work Permit, Designate Fire Watch. 3e. Conduct work zone inspection: – Verify that all combustible or flammable materials or equipment fuel sources have been removed from within 35 feet of the proposed hot work. – If combustible or flammable materials or equipment fuel sources have not been removed from within 35 feet of the hot work, verify that engineering and procedural controls have been emplaced: curtains, blankets, wetting, ventilation. 3e. Two 20-lb. Type ABC Fire extinguishers required. 3e. Conduct continuous air monitoring / Lower Explosive Limit (LEL) screenings. Action Level: 10% of the LEL. 3e. If ambient air concentrations exceed LEL Action Levels, STOP WORK and contact supervisor. 3e. Wear hard hat, long sleeved-shirt and safety glasses. Utilize job specific PPE such as welding jacket or chaps and welding glasses when using gas powered saw or a plasma cutter.
4. Secure area when leaving tools unattended.	**4a. CONTACT:** Unauthorized personnel may enter the work area	4a. Unplug saw when not being used. Store equipment in designated storage areas when not being used.
	4b. FALL: Slip/trip/fall	4b. Store tool in designated storage location when it is not being used, secure all extension cords, keep all equipment out of walkways. 4b. Keep work area free of Slip, Trip and Fall Hazards.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-006	DATE 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
Generic	**Drilling**	**Direct Push Soil Borings / Well Installation**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Timothy Zei	Project Hydrogeologist	Raymond Olson	Staff Assistant Geologist
		Christine Pietrzyk	Office Health & Safety Manager
		Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing, Long Sleeve Shirt	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Geoprobe or Truck-Mounted Direct Push Drill Rig, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Macrocore liners, Liner Opening Tool, 20 lb. Type ABC Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs, Water

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ) – All non-essential personnel will maintain a distance of 10 feet from drilling equipment while equipment is moving/engaged

"SHOW ME YOUR HANDS"
Driller and helper should show that hands are clear from controls and moving parts

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization of drilling rig (ensure the Subsurface Clearance Protocol and Drill Rig Checklist are completed)	**1a. CONTACT:** Equipment/property damage.	1a. The drill rig's tower/derrick will be lowered and secured prior to mobilization. 1a. A spotter should be utilized while moving the drill rig. If personnel move into the path of the drill rig, the drill rig will be stopped until the path is again clear. Use a spotter for all required backing operations. 1a. Set-up the work area and position equipment in a manner that eliminates or reduces the need for backing of support trucks and trailers. 1a. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1a. Drill rig should have a minimum **exclusion zone of 10 feet** for non-essential personnel (i.e., driller helper, geologist) when the rig is moving/ in operation.
	1b. FALL: Slip/trip/fall hazards.	1b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1b. Use established pathways and walk on stable, secure ground.
	1c. CONTACT: Crushing from roll-over.	1c Geoprobe should cross all hills/obstructions head on with the mast down to reduce risk of roll-over.
2. Raising tower/derrick of drill rig	**2a. CONTACT:** Overhead hazards.	2a. Prior to raising the tower/derrick, the area above the drilling rig will be inspected for wires, tree limbs, piping, or other structures, that could come in contact with the rig's tower and/or drilling rods or tools. 2a. Maintain a safe distance of 10' from overhead structures.
	2b. CONTACT: Pinch Points/Amputation Points when raising the rig and instability of rig	2b. Inspect the equipment prior to use and avoid pinch/amputation points. 2b. Lower outriggers to ensure stability prior to raising rig tower/derrick. 2b. If the rig needs to be mounted, be sure to use three points of contact.
3. Advancement of drilling equipment and well installation	**3a. CONTACT:** Flying debris	3a. Be aware of and avoid potential lines of fire and wear required PPE such as eye, ear, and hand protection.
	3b. EXPOSURE: Noise and dust.	3b. Wet borehole area with sprayer to minimize dust. 3b. Stand upwind and keep body away from rig. 3b. Dust mask should be worn if conditions warrant. 3b. Wear hearing protection when the drill rig is in operation.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Advancement of drilling equipment and well installation (Continued)	**3a. CONTACT:** Flying debris **3b. EXPOSURE:** Noise and dust. **3c. FALL:** Slip/trip/fall hazards. **3d. CAUGHT:** Limb/extremity pinching; abrasion/crushing. **3e. CONTACT:** Equipment imbalance during advancement of drill equipment. **3f. EXPOSURE:** Inhalation of contamination/vapors. **3g. EXERTION:** Potential for muscle strain/injury while lifting and installing well casings, lifting sand bags, and/or lifting rods.	3c. Contain drill cuttings and drilling water to prevent fall hazards from developing in work area. 3c. See 1b. 3d. Ensure all Emergency Safety Stop buttons function properly. 3d. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 3d. Inspect the equipment prior to use for potential pinch/amputation points. Keep hands away from pinch/amputation points and use of tools is preferable compared to fingers and hands. 3d. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3d. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3d. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment. 3d. Drillers and helpers will understand and use the "Show Me Your Hands" Policy. 3d. Spinning rods/casing have an **exclusion zone of 10 feet** while in operation. 3e. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and/or tip. 3e. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. 3e. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (**minimum exclusion zone of 10 feet**). 3f. Monitor ambient air for dangerous conditions using a calibrated photoionization detector (PID) to periodically monitor the breathing zone of the work area. 3f. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional precautions in accordance with the site specific health and safety plan. 3f. Use a multi-gas meter to monitor ambient air for dangerous conditions (i.e. unsafe levels of carbon monoxide when drilling indoors or the presence of explosive vapors). 3g. Keep back straight and bend at the knees. 3g. Utilize team lifting for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.
4. Remove sample liner.	**4a. EXERTION:** Potential for muscle strain/injury while removing liner from probe rod. **4b. CONTACT:** Pinch points and cuts **4c. EXPOSURE:** Inhalation and/or dermal contact with contaminants.	4a Utilize team lifting for objects over 50lbs. 4a. Use hydraulic liner extruder if available. 4b. Place liner on sturdy surface when opening. 4b. Don cut-resistant gloves and use appropriate liner cutter when opening liners. 4b. Always cut away from the body. 4c. Wear chemical-resistant disposable gloves when handling liners. 4c. See 3e.
5. Decontaminate equipment.	**5a. EXPOSURE/CONTACT**: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors). **5b. EXPOSURE:** To chemicals in cleaning solution including ammonia.	5a. Wear chemical-resistant disposable gloves and safety glasses. 5a. Contain decontamination water so that it does not spill. 5a. Use an absorbent pad to clean spills, if necessary. 5a. Spray equipment from side angle, not straight on, to avoid backsplash. 5a. See 3b. 5b. See 4a. Review SDS to ensure appropriate precautions are taken and understood.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-007	DATE 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**General Site Activity**	**Driving**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Valerie Sabatasso	Staff Scientist	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT: when outside vehicle ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES: when outside vehicle	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION ☒ SAFETY TOE BOOTS: when outside vehicle	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: high visibility vest, when outside vehicle	☒ GLOVES: Leather/ cut-resistant level 2 ☐ OTHER _____

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Motor Vehicle (i.e. car, truck, SUV)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE: A 10' minimum exclusion zone will be maintained around motor vehicles when operating.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Driving to/leaving Site	**1a. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc. *Common factors that may lead to CONTACT incident, but not limited to: • distracted driving (cell phone, GPS, radio, billboards, "rubber necking") • lack of situational awareness • unfamiliarity with traffic patterns/road layout • weather conditions (wet/icy roads, hydroplaning, black ice) • weariness • high speeds • obstructed vision (solar glare, debris on windshield, blind spots) • changes in travel pathway (construction, snow banks, non-operational signals, potholes, detours, special events) • improper vehicle maintenance (non-operational signal light, worn tires, cracked windshield, ineffective wipers) • loose or unsecure objects	1a. PLAN AHEAD – review/make yourself familiar with maps and driving directions before beginning the drive to the Site. Do not attempt to drive and review maps/directions at the same time. Pull over and stop your vehicle before looking at maps/directions. 1a. Complete a basic vehicle inspection before driving. Verify Inspection and Registration are current, tires and wipers are in good condition, all lights are functional, all glass/mirrors are undamaged, the horn is functional, roof/hood/trunk are free from accumulated snow and visibility is not impaired due to snow/ice/frost/fog on windows. 1a. Do not hang items in car that can obstruct your view or become projectiles in a collision. 1a. Do not get distracted using touch screen radios or GPS units built into newer models. Keep your eyes on the road and stay alert. 1a. Follow posted speed limits and obey traffic signals and roadway signs. 1a. Always wear your seat belt and shoulder harness when driving. 1a. When driving around large vehicles and trucks, maintain extra space as these vehicles may not be able to see a smaller car too close. 1a. Follow the "Rules of the Road" including: using your turn signals, coming to a complete stop, and allowing vehicles the right of way (yield) when they are when traffic laws require. 1a. Apply the Smith Five Keys® of safe driving • Aim High in Steering® - Expand eye lead time to a minimum of 15 seconds • Get the Big Picture® - Maintain proper a 4 second minimum following distance at all times - Scan mirrors every 5-8 seconds to achieve a circle of awareness - Position your vehicle so you can see relevant/non-relevant objects • Keep Your Eyes Moving® - Try to maintain about 180 degrees of visibility - Avoid blank and fixed stares. Avoid focusing on one object for more than 2 seconds • Leave Yourself an Out® - Avoid traveling in traffic clusters - Surround yourself with space - Anticipate the actions of others

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Driving to/leaving Site (cont'd)	**1a. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc.	• Make Sure They See You® - Maintain eye contact with on-coming vehicles/pedestrians - Use warning devices (e.g., hand signals, high-lights, horns etc.) - Proper timing is essential 1a. Do not perform reconnaissance or inspections while driving. Your vehicle should be parked in a safe location when viewing or surveying the Site and vicinity 1a. Avoid sudden turns and stops. Don't drive recklessly – be in control of vehicle at all times. 1a. In inclement weather, first determine if work can be POSTPONED. Otherwise, plan according to weather conditions including checking forecast along entirety of travel route (especially, for long distances). Reduce speed as road conditions warrant. Travelling with winter car equipment, in the winter, is strongly recommended (i.e., shovel, scraper, brush, blanket, extra clothing, flashlight, bag of sand). If your vehicle has 4-wheel drive, review to operators manual and understand operating procedure prior to engaging 4-wheel drive. If at any point on your drive weather becomes too severe to proceed safely pull over if safe to do so or seek nearest cover (e.g., overpass) 1a. If feeling drowsy or sleepy, do not drive. Pull over in a safe place to rest if you experience any signs of drowsiness. Make sure to get adequate sleep the night before an early drive. 1a. Never operate a vehicle under the influence of alcohol or illegal substances or medications affecting your performance. 1a. Keep your eyes on the road. Do not call or talk on cellular phones. Pull over to a safe location if you must answer or make a call. (Legal requirement in: CA, CT, DE, D.C., HI, IL, LA*, MD, NV, NH*, NJ, NM, NY, OK*, OR, TX*, VT, WA, WV as of 01/20/15; per www.IIHS.org) * = Applicable to some drivers, situations or to be implemented in 2015 1a. When parking, pull-through when possible. If backing is required visually inspect area to ensure it is free from obstructions prior to backing in and relying solely on mirrors; use spotters when available.
2. Entering/Exiting Vehicle.	**2a. CAUGHT:** Personal injury (broken fingers/hand) while entering or exiting vehicles **2b. FALL:** Personal injury (twisted ankle, deep contusion, concussion, broken wrist/arm, etc.) from slip/fall on uneven or unstable or slippery surface while exiting/entering vehicle **2c. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc.	2a. Open and close doors slowly. Never put hands or feet in between door and vehicle to avoid pinch points. 2b. When exiting the vehicle make sure your feet are on firm footing and weight is evenly distributed before exiting/standing. In inclement weather use hands to support yourself, by holding the car door and/or steering wheel, when exiting the vehicle. 2c. Check both directions for traffic before opening door. Do not exit vehicle if traffic does not permit you to exit safely 2c. Check anticipated path of door prior to opening, do not open door into any obstructions (e.g., bollards, high curbing)

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-010	DATE 7/6/2020	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Surveying**	**Elevation Surveying**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Mark M Emmons	Project Engineer	Brian Hobbs	Corporate Health & Safety Manager
Bjorn Wespestad	Senior Engineer		
William Hansen	Senior Engineer		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant or leather
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☒ OTHER: Long sleeve Shirt
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel-toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Surveying equipment (i.e., leveling rod/measuring ruler, tripod and autolevel).

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site manager/ property owner.	**1a. CONTACT/EXPOSURE/FALL:** Lack of communication could result in H&S incident.	1a. Inform Site personnel of work scope, timeline and location(s). 1a. Inquire about other activities taking place at the Site. 1a. If applicable, obtain General Work permit for the day.
2. Locate surveying position for instrument and rod and set-up work area	**2a. FALL:** Slip/trip hazards	2a. Inspect area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.) and obstructions prior to setting up at the survey location. Keep eyes engaged with walking surface while in movement. Remember "Walking is Working." 2a. Conduct housekeeping and maintain clear paths to walk in and remove debris as required.
	2b. CONTACT: Traffic (surveying locations could potentially be in parking areas and sidewalks)	2b. Be aware of oncoming traffic. Utilize a flagman / spotter for locations in streets or high-traffic areas. 2b. Place 42 inch cones around the work area and delineate work zone with caution tape, snow fencing or safety bars, if necessary. 2b. Wear appropriate PPE including long sleeve high visibility clothing and or reflective safety vest. 2b. Face traffic, maintain eye contact with oncoming vehicles and establish a safe exit route.
	2c. OVEREXERTION: Hazard due to carrying, lifting, and bending while transporting equipment	2c. Use proper body positioning and lifting techniques; keep back straight, lift with legs, keep load close to body, and never reach with a load. 2c. Avoid carrying too much equipment at one time and team-lift equipment that is more than 50 lb.
	2d. CAUGHT/CONTACT: Pinch Points / sharp edges associated with setting up the tripod	2d. Wear cut resistant gloves when handling the tripod and keep fingers away from pinch points located near moving parts of the tripod. Don't carry tripod by the pointed ends.
	2e. OVEREXERTION: Hazard due to bending awkwardly to look through the autolevel	2e. When practical, set the height of the autolevel optic as to minimize bending at the waist.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Open / close manhole cover to well that is being surveyed (if necessary).	**3a. OVEREXERTION:** Muscle strain	3a. See 1c. Bend knees when reaching to open well. Use manhole lifting hook or pry bar to avoid bending.
	3b. CAUGHT: Pinch points associated with removing / replacing manholes and working with hand tools	3b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 3b. Use proper tools (ratchet and crowbar or pry bar for well cover) and inspect before use. 3b. Do not put fingers under well cover.
	3c. EXPOSURE: To potentially hazardous vapors To biological hazards	3c. No open flames/heat sources. 3c. To minimize exposure to vapors, allow well to vent after opening it and before survey activities begin. 3c. Work on the upwind side of manhole/well. 3.c Use caution while opening lids to inspect work area for bees and insects inside of covers. 3c. Use insect/tick repellent as necessary.
	3d. CONTACT: With traffic	3d. See 2b.
4. Perform survey.	**4a. FALL:** Slip/trip hazards	4a. See 2a.
	4b. CONTACT: Traffic (surveying locations could be potentially located in parking areas and sidewalks)	4b. See 2b. 4b. Personnel using the scope will be devoting most of their attention to the surveying activity and shall be aware of vehicular and pedestrian traffic. Personnel holding the measuring stick should be extra vigilant of survey personnel and communicate any potential hazards to the instrument person via handheld radio or similar means. Ensure reflective safety vest is worn.
	4c. ENERGY SOURCES: Electrical shock from survey rod striking overhead electric lines or lights	4c. Prior to raising and extending the survey rod, personnel should thoroughly inspect the area above the measuring point. If overhead electrical lines are encountered within 20 feet of the measuring point; stop work and consult with the office health and safety officer.
5. Break down work area.	**5a. CONTACT:** Traffic (surveying locations can potentially be in parking areas and sidewalks)	5a. See 2b.
	5b. EXERTION: Hazard due to carrying, lifting, and bending while transporting equipment	5b. See 2c.
	5c. CONTACT: Personal injury or equipment damage by striking surroundings with an extended rod or unsecured tripod leg	5c. Ensure rod is entirely collapsed prior to mobilization / demobilization between survey points. 5c. Ensure tripod legs are fully collapsed and secured with strap prior to mobilization / demobilization between set-ups.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-011	DATE: 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)	
Generic	**Construction - Excavation**	**Excavation / Trenching**	

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Senior Engineer	Brian Hobbs	Corporate Health & Safety Manager
Ian Holst	Senior Engineer		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather or cut resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☒ LONG SLEEVED SHIRT	☒ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility long sleeved clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-toe boots		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Jackhammer, Excavator, Backhoe, Hand Tools, Photoionization Detector, barrels, 42" traffic cones, snow fencing, telescoping poles, temporary chain link fence, ladders, shovels, digging bars, power tools (cut-off saw), Two-way radios, Sheeting, Trench box, Retractable lanyard, Harness

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around equipment in motion and outside the swing/tip radius.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Pre-Clearance Protocol.	**1a. CONTACT:** Damage to underground utility.	1a. Confirm that (if applicable) "Call Before You Dig" and local utility companies were contacted prior to trenching in order to confirm utility mark outs. Must have a case # before digging.
	1b. ENERGY SOURCE/CONTACT: Property damage; Pressurized water mains may cause lacerations or broken bones. Pressurized gas mains may explode causing serious injury, or death. Underground electric may cause severe burns, shock, or death.	1b. Pre-clearing of the trenching location must be conducted to a minimum of 5 vertical feet below the ground surface (10 feet minimum for Critical Zone) using hand tools (shovel and non-metallic dig bar) prior to trenching. Supervisor should be contacted to discuss appropriate pre-clearing depth. Complete subsurface clearance checklist.
	1c. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	1c. Be aware of the conditions when walking or loading equipment and working. Walk within established pathway avoiding uneven surfaces. Remove potential slip/trip/fall hazards.
2. Set up work zone.	**2a. CONTACT/CAUGHT:** Cuts/lacerations from equipment. Broken bones from contact by vehicle.	2a. Isolate work area from hazards with cones, barricades, and snow fencing, telescoping poles or temporary chain link fence. Utilize a flag person when necessary (i.e., third party traffic in area). Install traffic signs in roadways and for detours. Spotters will maintain and enforce exclusion zone.
	2b. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	2b. See 1c.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Trenching Activity.	**3a. CONTACT:** Serious injury including broken bones, muscle strains or tears, and possibly death due to contact with machine.	3a. Spotter(s) required for all heavy equipment operation. No worker shall be allowed inside the exclusion zone or along the trench/excavation area while any equipment is in operation. A minimum exclusion zone greater than the length of the equipment boom must be established. Workers only allowed in exclusion zone if the operator is in "Hands Off "mode. Operator will not operate equipment until worker is out of exclusion zone. Spotters and operators will have radios for communication, when either loses sight of one another, and/or in case of emergency.
	3b. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones	3b. Any trench/excavation deeper than 3' must have a ladder within 25' of any worker in the excavation. At least 3'(rungs) of the ladder shall be above the top of the excavation. All spoil piles shall be maintained 2' minimum from edge of excavation. 3b. Any trench/excavation deeper than 6' must have fall protection, retractable lanyard for ladder use, and 42" high guardrails along the edge of the trench/excavation.
	3c. EXPOSURE: Noise, Dust, Concrete- Asphalt, petroleum hydrocarbon vapors may cause damage to ears and lungs	3c. Air monitoring using a calibrated photoionization detector (PID) will be used to monitor the breathing zone of the work area. If a reading of >5ppm is recorded, the oversight personnel must temporarily cease work and instruct all Site personnel to step away from the area of elevated readings.
4. Setting Trench protections if necessary.	**4a. CAUGHT:** Injury due to contact with failed trench, may include muscle strains or tears, abrasions or lacerations, broken bones and possibly death.	4a. To prevent cave-ins and avoid caught by/between, excavations over 4' in depth, unless working in stable rock, shall have engineer approved shoring, sheeting or trench box. Top of protection shall be at least 2' above top of excavation.
	4b. CONTACT/CAUGHT: Injury due to rigging activities and entering exclusion zone during lifting and/or transport of shoring/trench box/material may include muscle strains or tears, abrasions or lacerations, broken bones and possibly death.	4b. Use only inspected rigging with 2, 3 or 4 lift points; wear cut-resistant gloves. Rigging to be hooked up to factory installed hook up points on equipment. Control load with non-conductive tag lines with workers out of exclusion zone. Don't stand underneath suspended load; wear steel toed boots and hard hat.
	4c. FALL: Possible injury due to fall into excavation may include muscle strains or tears, abrasions or lacerations, or broken bones.	4c. Shoring to be set and sides will be backfilled to avoid fall hazards before workers are allowed to enter area. Operator will be in "HANDS OFF" mode before workers enter work area to unhook rigging. An inspected ladder extending 3' above top of the shoring will be used to enter and exit the shoring. Workers will use three points of contact when using the ladder.
5. Secure/Leave Site. If backfilling, see excavation backfilling and compaction JSA for potential hazards and critical actions.	**5a. FALL:** Potential Slip, Trip or Fall - may cause muscle strains or tears, abrasions or lacerations, or broken bones.	5a. See 1c. 5a. All open excavations must be backfilled or secured prior to departure with steel plates, orange construction fence or temporary chain link fencing.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-012	DATE 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE:	WORK ACTIVITY (Description):
Generic	**Construction - General**	**Installation or Repair of Chain Link Fence**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Ray Greenidge	OHSM	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION ☒ SAFETY SHOES: Steel or Composite toed boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Cut-resistant ☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Fence materials, Hand tools, Power Tools, GFCI

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure work zone	**1a. FALL:** Slip, trip, or fall hazards associated with site conditions.	1a. Maintain good housekeeping and keep work area free of potential Slip, Trip and Fall hazards. 1b. Utilize Traffic Control devices to secure work zone (42" traffic cones with flags, and caution tape).
	1b. CONTACT: Vehicular and pedestrian traffic.	1b. Use work truck or rigid barriers to barricade the side of work area in the line-of-fire of vehicular traffic.
2. Development of anchor locations for Post-Holes for fences using either a Hammer drill or Post-Hole digger.	**2a. CONTACT:** Potential cut/abrasion hazards and splinters. Operation of hammer drill can result in ejected debris and eye hazard.	2a. De-energize power tools by removing battery packs or unplugging electrical supply prior to switching out components (i.e., Sawsall blades or drill bits). 2a. Unplug from electrical power or remove battery pack from tools before handing them off to another person. 2a. Wear Cut resistant gloves and safety glasses.
	2b. ERGONOMICS: Back strain while maneuvering Post-Hole digger or Shovel.	2b. Utilize proper lifting techniques when using digging tools. Keep back straight, bend at the knees, keep load close to body, turn with legs, and do not twist back. 2b. Inspect post-hole digger prior to use. Ensure there are no splinters on handle. Ensure that the shovel section bolts are in good working condition. 2b. Wear leather or cut-resistant gloves.
	2c. EXPOSURE: Operation of hammer drill can generate greater than 85 dBAs	2c. Wear hearing protection. Personnel not involved in the task must stand at least 10-foot away from the operating hammer drill.
	2d. ENERGY SOURCE: Electric hazards from operation of power tools.	2d. Use heavy-duty, outdoor cords with ground, rated for the electrical load required. Inspect extension cords, verify good condition; no exposed wires, cuts, damage, worn insulation, or damaged plugs. 2d. If the use of a generator is required, do not refuel generator while it is running. 2d. Use GFCI.
	2e. ERGONOMICS: Vibration injury.	2e. Wear vibration resistant gloves.
	2f. EXPOSURE: Exposure to generator noise/fumes.	2f. See 2c. 2f. Position generator such that exhaust is pointed away from workers or downwind of work area. Wear hearing protection if generator cannot be positioned out of the work area and if noise levels exceed 85 dBAs.
	2g. FALL: Trip hazards from equipment being left in work zone.	2g. Maintain good housekeeping and keep work area free of Slip, Trip and Fall hazards. Stage tools in designated areas at lowest potential energy. 2g. When possible route extension cords and hoses overhead or outside of walk path.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Manual lifting of fence materials	**3a. EXERTION/ERGONOMICS:** Back strain and personal injury from lifting heavy loads.	3a. 50 lbs is the maximum allowable weight per manual lift. Use a mechanical lifting device or the buddy system if the weight is greater than 50 lbs. 3a. Keep back straight, bend at the knees, and keep load close to body when lifting. 3a. Use buddy system when lifting awkward materials.
	3b. CONTACT: Potential cut/abrasion hazards.	3b. Ensure long sleeves are covering arms, wear cut-resistant gloves. Avoid grabbing sharp edges.
4. Installation of chain link fence or fabric.	**4a. OVEREXERTION:** Back strain and personal injury from lifting heavy loads	4a. See 3a.
	4b. CONTACT: Potential cut/abrasion hazards on fencing.	4b. Avoid sharp edges on fencing; ensure long sleeved shirts are fully covering arms, wear cut-resistant gloves. 4b. Use retractable knife for cutting privacy fabric.
5. Housekeeping.	**5a. FALL:** Slip, trip, fall hazards from items left in the work zone.	5a. Clean up loose items including fabric cuttings, tools, etc. 5a. Remove Slip, Trip and Fall hazards from the work area. 5a. Inspect work area to verify it is left in a safe condition.

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JOB SAFETY ANALYSIS Ctrl. No. GEN-013	DATE 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE:	WORK ACTIVITY (Description):
Generic	**Gauging and Sampling**	**Gauging and Sampling**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Brandon Tufano	Staff Geologist	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☒ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☐ HEARING PROTECTION ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Knee pads, Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

42-inch Safety Cones, Caution Tape, Interface Probe and/or Water Level Meter, 20-lb., Type ABC Fire Extinguisher, Buckets. Tools as needed: Socket Wrench, Screw Driver, Crow Bar, Mallet, and Wire Brush.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization to monitoring well(s).	**1a. FALL:** Personal injury from slip/trip/fall due to uneven terrain and/or obstructions.	1a. Inspect pathway and plan for most suitable designated pathway prior to mobilization. 1a. Use established pathways, walk and/or drive on stable, secure ground and avoid steep hills or uneven terrain. 1a. If working near open water with an unguarded edge, wear life vest.
	1b. CONTACT: With traffic/third parties.	1b. Identify potential traffic sources and delineate work area with 42-inch traffic safety cones. Position vehicle to protect against oncoming traffic. Use caution tape to provide a more visible delineation of the work area if necessary. 1b. Wear appropriate PPE including high visibility clothing or reflective vest. 1b. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route.
	1c. EXERTION: Muscle strain from lifting equipment	1c. Use proper lifting techniques when handling/moving equipment; bend knees and keep back straight. 4c. Use mechanical assistance or team lifting techniques when equipment is 50 lbs. or heavier. 4c. Make multiple trips to carry equipment.
	1d. EXPOSURE: To biological hazards.	1d. Inspect work area for bees and insects. 1d. Use insect/tick repellent as necessary.
2. Open/close well.	**2a. EXERTION:** Muscle strain.	2a. Use proper lifting techniques; keep back straight, lift with legs and bend knees when reaching to open/close well.
	2b. CAUGHT: Pinch/crush points associated with removing/replacing manholes and working with hand tools.	2b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 2b. Use proper tools (ratchet and pry bar for well cover) and inspect before use. 2b. Do not put fingers under well cover.
	2c. CAUGHT: Pinch points associated with placing J-plug back onto PVC pipe.	2c. See 2b. 2c. Keep fingers out of line-of-fire when securing cap.
	2d. EXPOSURE: To potential hazardous vapors.	2d. No open flames/heat sources. 2d. To minimize exposure to vapors, allow well to vent after opening it and before sampling activities begin. 2d. Stand up-wind, if possible, to avoid inhaling vapors.
3. Gauge well.	**3a. CONTACT:** With contamination (e.g. contaminated groundwater).	3a. Wear chemical-resistant disposable gloves (over cut-resistant gloves) and safety glasses when gauging well. 3a. Insert and remove probe slowly to avoid splashing. 3a. Use an absorbent pad to clean probe.
	3b. CONTACT: With traffic.	3b. See 1b.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
4. Purge and sample well	**4a. EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors) and/or sample preservatives.	4a. Open and fill sample jars slowly to avoid splashing and contact with preservatives. 4a. Wear cut-resistant gloves and chemical-resistant disposable gloves when sampling. 4a. Fill sample containers over purge container to avoid spilling water onto the ground. 4a. Use an absorbent pad to clean spills. 4a. When using a bailer to purge a well, pull the bailer slowly from the well to avoid splash hazards. 4a. When sampling or purging the water using a bailer, pour out water slowly to reduce the potential for splash hazards with groundwater. 4a. When using a tubing valve always remove the valve slowly after sample collection to release any pressure and avoid pressurized splash hazards. 4a. When collecting a groundwater sample always point sampling apparatus (tubing, bailer, etc.) away from face and body.
	4b. CONTACT: Personal injury from cuts, abrasions, or punctures by glassware or sharp objects.	4b. To avoid spills or breakage, place sample ware on even surface. 4b. Do not over tighten caps on glass sample ware. 4b. Wear chemical-resistant nitrile disposable gloves over cut-resistant (i.e., Kevlar) gloves when sampling and handling glassware (i.e., VOA vials) or when using cutting tools.
	4c. EXERTION: Muscle strain while carrying equipment.	4c. Use proper lifting techniques when handling/moving equipment, bend knees and keep back straight. 4c. Use mechanical assistance or team lifting techniques when equipment is 50 lbs. or heavier. 4c. Make multiple trips to carry equipment.
	4d. CONTACT: With traffic.	4d. See 1b.
	4e. CONTACT: Pinch points with groundwater pump components (i.e., wheel, line, clamps).	4e. Wear leather gloves when working with groundwater pumps. 4e. Never place hands on or near pinch points such as the wheel, clamps or other moving parts during pump operations. 4e. Use the correct mechanisms, such as a pump reel, to lower pump into well. 4e. Never attempt to manually stop any moving part of equipment including hose reels and/or tubing.
	4f. EXERTION: Muscle strain from repetitive motion of bailing and sampling a well.	4f. See 4c. 4f. Include a stretch break when repetitive motions are part of the task.
5. Management of purge water.	**5a. EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors).	5a. Do not overfill container and pour liquids slowly so that they do not splash. 5a. Properly dispose of used materials/PPE in appropriate container in designated storage area.
	5b. EXERTION: Muscle strain from lifting/carrying and moving containers.	5b. Use proper lifting techniques when lifting / carrying or moving container(s) (see 4c.). 5b. Do not overfill container(s).
6. Decontaminate equipment.	**6a. EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors).	6a. Work on the upwind side, where possible, of decon area. 6a. Wear chemical-resistant disposable gloves and safety glasses. 6a. Use an absorbent pad to clean spills.
	6b. CAUGHT: Pinch points associated with handling hand tools	6b. See 2b. 6b. Inspect hand tools for sharp edges before decontaminating.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-014	DATE: 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
Generic	**Drilling**	**Hollow Stem Auger Soil Borings / Well Installation**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Douglas Ferraiolo	Staff Geologist	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☒ GOGGLES: Spoggles required if winds exceed 15 mph. ☐ FACE SHIELD ☒ HEARING PROTECTION: (as needed). ☒ SAFETY SHOES: Steel or Composite Toe.	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent long-sleeve shirt or long-sleeve shirt and reflective safety vest.	☒ GLOVES: Leather, Cut-Resistant, and Nitrile. ☒ OTHER: Insect Repellant, Sunscreen (as needed).

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Truck-Mounted Drilling Rig or Track Rig, Saw, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Interface Probe, 20 lb. Type ABC Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ) – All non-essential personnel shall maintain a **10 foot** exclusion zone while drill rig is engaged.

"SHOW ME YOUR HANDS"
Driller and helper should show that hands are clear from controls and moving parts

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization / demobilization and establish a work area.	**1a. See Mobilization/ Demobilization JSA GEN-015.**	1a. See Mobilization / Demobilization JSA GEN-015.
2. Raising tower / derrick of drilling rig.	**2a. CONTACT:** Overhead hazards.	2a. Prior to raising the tower / derrick, the area above the drilling rig will be inspected for overhead hazards (wires, tree limbs, piping or other structures) that may be contacted by the rig's tower or drilling rods. 2a. The tower / derrick must not be raised beneath overhead power lines unless approved by the Roux PM. 2a. Maintain a minimum of 10' from all overhead structures. 2a. Do not move the rig while the tower / derrick is raised.
	2b. CONTACT: Amputation / crush points when raising the rig and instability of rig.	2b. Inspect the equipment prior to use and avoid any potential amputation points. 2b. Lower outriggers to ensure stability prior to raising rig tower derrick. Keep feet and body out of the line of fire when lowering out-riggers. 2b. Inspect the set-up location for uneven terrain. Level or avoid area if needed. 2b. If the rig needs to be mounted, be sure to use three points of contact.
3. Advancement of augers for soil boring installation.	**3a. CONTACT:** Equipment imbalance during advancement of drill equipment.	3a. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and / or tip. 3a. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. 3a. Drillers will maintain the "Purple Zone" policy surrounding augers to ensure no personnel come into contact with augers while in use. Workers will spray paint a 3' semi-circle surrounding the augers to visually show that no personnel should enter the "Purple Zone" while drilling activities are being conducted. 3a. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (minimum exclusion zone of 20 feet).
	3b. CONTACT: Flying / spraying debris.	3b. Wear all required PPE (especially hand, eye, and ear protection). 3b. Maintain minimum 20' EZ distance when rig is in operation to avoid potential line of fire hazards from flying materials or debris.
	3c. CAUGHT: Limb/extremity amputation, abrasion, and crushing.	3c. Inspect the equipment prior to use for potential pinch points. 3c. Test all emergency shutdown devices prior to drilling. 3c. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3c. Inspect augers, do not use if auger flight is damaged or bent.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Advancement of augers for soil boring installation (Continued).		3c. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3c. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment particularly when installing auger flights and steel override casings. 3c. Drillers and helpers will understand and use the "Show Me Your Hands" Policy. 3c. Spinning augers should have an exclusion zone of 20 feet when in operation.
	3d. FALL: Slip/trip/fall hazards.	3d. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 3d. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 3d. Use established pathways and walk on stable, secure ground. 3d. Use three points of contact when mounting or dismounting the rig. 3d. Remove soil cuttings to avoid a tripping hazard from developing near augers.
	3e. EXPOSURE: Inhalation of contamination / vapors.	3e. Air monitoring using a calibrated photoionization detector (PID) to periodically monitor the breathing zone of the work area. 3e. The Action Level for breathing zone air is five parts per million (sustained) as detected by the PID. 3e. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional appropriate precautions in accordance with the site specific health and safety plan.
	3f. EXPOSURE: Noise and dust.	3f. Wet borehole area with sprayer to minimize dust. Stand upwind and keep body positioned away from rig. 3f. Wear hearing protection while drill rig is operating and / or the noise levels exceed 85 dBA.
	3g. EXERTION: Installing well casings and lifting augers.	3g. Keep back straight and bend at the knees. 3g. Utilize team lifting for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.
4. Installation of well materials.	**4a. CONTACT:** Installing well materials while also pulling up augers. **4b. CAUGHT:** Possible pinch or crush hazard assembling PVC and sending down the borehole. **4c. FALL:** Slip/trip/fall hazards with hand tools and materials. **4d. EXPOSURE:** Potential contamination, harmful vapors, dust, and / or noise. **4e. EXERTION:** Lifting heavy bags of materials to backfill borehole.	4a. Potential contact with augers during installation of well materials. 4a. Keep distance from augers and do not place any materials while augers are in motion. 4b. Keep all body parts out of potential pinch points while placing PVC together and sending down borehole. 4c. See 3d. 4d. See 3e and 3f. 4d. Stand upwind to avoid exposure to dust generated from packing materials. 4e. Ergonomic hazard lifting bags of sand and bentonite while packing the well.
5. Cleaning the auger flights	**5a. CONTACT:** Cuts/scrapes or puncture wound from contacting auger.	5a. Follow "Show Me Your Hands" Procedure and make sure auger is out of gear before contacting auger with tool or hand. 5a. Pull cleaning tool across your body with handle away from body; do not push toward the auger. 5a. Do not clean more than ¾ turn around the auger at a time. 5a. Wear cut resistant and leather gloves. 5a. Always use two hands to operate cleaning tool. 5a. Inspect tool before use and remove from service if handle or metal are cracked/fatigued. 5a. Stand out of the line of fire.
6. Decontaminate equipment.	**6a. EXPOSURE / CONTACT:** To contamination (e.g., contaminated groundwater, vapors). **6b. EXPOSURE**: To chemicals in cleaning solution (including ammonia).	6a. Wear chemical-resistant disposable gloves and safety glasses. 6a. Contain decontamination water so that it does not spill. 6a. Use an absorbent pad to clean spills, if necessary. 6b. See 3e. Wear all appropriate PPE and stand upwind of any exposed cleaning solutions.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-015	DATE: 8/6/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Recon**	**Mobilization/Demobilization**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Rebecca Lowy	Staff Assistant Geologist	Brian Hobbs	Corporate Health & Safety Manager
Tally Sodre	OHSM		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION (as needed) ☒ SAFETY SHOES: Steel Toe or composite toe	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest of high-visibility clothing; long sleeve shirt; long pants	☒ GLOVES: Leather, nitrile, and cut resistant (as needed) ☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Varies

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around equipment in use..

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilize/demobilize and establish work area	**1a. FALL:** Slip/trips/falls from obstructions, uneven terrain, weather conditions, heavy loads, and/or poor housekeeping.	1a. Use 3 points-of-contact/ensure secure footing when entering and exiting vehicle. 1a. Inspect walking path for uneven terrain, steep hills, obstructions, and/or weather-related hazards (i.e., ice, snow, and puddles) prior to mobilizing equipment. Use established pathways. Walk on stable/secure ground. 1a. Do not climb over stored materials/equipment; walk around. Practice good housekeeping; organize and store equipment neatly in one area at its lowest potential energy. 1a. Wear boots with adequate treads. 1a. Delineate unsafe areas with 42” cones, caution tape and/or flagging.
	1b. CONTACT: Personal injury and/or property damage caused by being struck by Site traffic or equipment used in Site activities.	1b. Observe and maintain the posted speed limits. 1b. When first arriving onsite, park vehicles in designated parking space and/or out of the way locations. Use parking brake on all vehicles and tire chocks on work trucks and trailers. 1b. Check in with Site Manager/Supervisor to ensure coordination with other Site activities and to discuss any special hazards. Ensure that short-service employees (SSE) are identified. 1b. Identify potential traffic sources. 1b. Wear PPE including high visibility clothing or reflective vest. 1b. Use a spotter while moving work vehicles; plan ahead to avoid backing whenever possible. 1b. Maintain a minimum 10’ exclusion zone when vehicles are in motion. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver-to-spotter visibility. 1b. Delineate work area with 42” cones, flags, caution tape, and/or other barriers. 1b. Position “Work Area” signs at Site entrances, if possible, or at either side of work area.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
		1b. Position largest vehicle to protect against oncoming traffic. 1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route. 1b. Observe potential overhead and ground surface features that may interfere with moving equipment. Clear the path of physical hazards prior to initiating mobilization.
	1c. CAUGHT: Personal injury from pinch points and being in line-of-fire of vehicle and/or equipment.	1c. Make sure driver has engaged parking brake and placed wheel chocks in a position to prevent movement. Be sure that vehicle is parked in front/down gradient (positioned to best block oncoming traffic) of work area. 1c. Wear leather gloves when handling any tools or equipment. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects/cutting tools/glass. 1c. Keep body parts away from line-of-fire of equipment. 1c. Always carry tools by the handles and/or designated carrier. Ensure sharp-edged tools are sheathed/secure. 1c. Remove any loose jewelry. Avoid wearing loose clothing and/or ensure loose clothing is secure. 1c. Secure all items on the equipment, tighten up any items or features that have potential to shift or break during mobilization.
	1d. OVEREXERTION: Muscle strains while lifting/carrying equipment.	1d. Use body positioning and lifting techniques that avoid muscle strain; keep back straight, lift with legs, turn with whole body, keep load close to body, and never reach with a load. 1d. Ensure that loads are balanced. Use assistance (mechanical or additional person) to carry equipment that is either unwieldy or over 50 lbs.
	1e. EXPOSURE: Personal injury from exposure to biological and environmental hazards.	1e. Inspect area to avoid contact with biological hazards (i.e. poisonous plants, stinging insects, ticks, etc.). 1e. Wear long sleeved clothes treated with Permethrin, apply insect repellant containing DEET to exposed skin, and inspect clothes and skin for ticks during and after work. 1e. Apply sunscreen (SPF 15+) if exposure to sun for 30 minutes or more is expected.
	1f. EXPOSURE: Weather related injuries.	1f. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, nausea, rapid and shallow breathing). Take breaks in cool places and hydrate as needed. 1f. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks in warm areas as needed. 1f. Wear clothing appropriate for weather and temperature conditions (e.g., rain jackets, snow pants, multiple layers). 1f. If lightning is observed, wait 30 minutes in a sheltered location (car is acceptable) before resuming work.
	1g. EXPOSURE: Personal injury from noise hazards.	1g. Wear hearing protection if sound levels exceed 85 dBA (if you must raise your voice for normal conversation).

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-017	DATE 8/6/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
GENERIC	**Drilling**	**Monitoring and Recovery Well Development**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Amy Hoffman	Staff Geologist	Brian Hobbs	Corporate Health & Safety Manager
Ron Lombino	Staff Geologist		
Courtney Lind	Staff Engineer		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather or cut-resistant and Nitrile
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☒ OTHER: Insect repellant, sunscreen (as needed)
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION (as needed)	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Composite-toe or steel toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment as needed: Truck Rig or support truck, Trailer, 42-inch Safety cones and flags, Caution Tape, Interface Probe, Power Source, Submersible Pump, Surge Block/Plunger, 20 lb. Type ABC Fire Extinguisher, Holding Tanks and/or Buckets, Absorbent Pads, 5-gas meter, Tools as needed: Socket and Pipe Wrench, Screw Driver, Pry Bar, Ratchet, Vault Key.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain a 20 Foot EZ During Development Activities

"SHOW ME YOUR HANDS"
Driller and helper should show that hands are clear from controls and moving parts

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization / Demobilization (**Review Mobilization and Demobilization JSA**)	**1a. CONTACT:** Equipment/property damage.	1a. The truck rig's tower/derrick will be lowered and secured prior to mobilization. 1a. Set-up the work area / position equipment in a manner that eliminates or reduces the need for backing of trucks and trailers. 1a. All non-essential personnel should **maintain an exclusion zone of 20 feet**. 1a. Beep horn twice before backing up. 1a. When backing up with an attached trailer use a spotter Level or avoid if needed.
	1b. FALL: Slip/trip/fall hazards.	1b Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Store equipment at lowest potential energy.
2. Open/close well.	**2a. EXERTION:** Muscle strain (some wells have large vault covers).	2a. Keep back straight, lift with legs, keep load close to body, and never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Two people are required when lifting objects over 50 lbs or when the shape makes the object difficult to lift.
	2b. CAUGHT: Pinch points associated with removing/replacing manholes and working with hand tools.	2b. Wear cut-resistant/leather gloves when working with well vault/cover and hand tools. Do not put fingers under well vault/cover. 2b. Use ratchet and pry bar for well cover and inspect before use.
	2c. EXPOSURE: Potentially hazardous vapors.	2c. No open flames/heat sources. 2c. Allow well to vent after opening it and before starting development activities to minimize exposure to vapors. Air monitoring must be performed prior to set up and during the well development activities. Work on upwind side of well.
	2d. CONTACT: Traffic.	2d. Wear required PPE including high visibility clothing or reflective vest. 2d. Delineate work area with 42" safety cones and/or other barriers. Position vehicle to protect against oncoming traffic. 2d. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Develop well (mechanical surging).	**3a. CAUGHT:** Cut hazards and finger pinch points.	3a See 2b. 3a. Use required PPE including leather/cut-resistant gloves when handling development equipment. Identify finger/hand pinch points. Keep hands away from active surge equipment. 3a. All non-essential personnel should **maintain an exclusion zone of 20 feet**.
	3b. CONTACT/EXPOSURE: Contamination (e.g., SPH, contaminated groundwater, vapors).	3b. See 2c. 3b. Wear Nitrile gloves and safety glasses. Insert and remove surge block/plunger and line/cable slowly to avoid splashing at the surface. 3b. Use an absorbent pad to clean any spills.
	3c. EXERTION: Muscle strain from lifting equipment.	3c. See 2a. 3c. Use mechanical device to insert and remove surge block/plunger if greater than 50lb.
	3d. CONTACT: Injury while handling wench line/cable, or with active surging equipment.	3d. If using a drill rig, inspect all wench lines/cables for any kinks or if frayed prior to use. Replace any damaged lines/cables. Review **Drill Rig checklist prior to development activities**. 3d. See 3a.
4. Purging well (pumping water to holding tanks/drums/buckets).	**4a. CAUGHT:** Pinch points associated with connecting hose to tank. Pinch points associated with handling pump and hoses.	4a. See 3a. 4a. Ensure that fingers are not placed near coupling when attaching and securing hose(s). Do not place fingers under pump/hoses. Wear leather or cut-resistant gloves when handling pump/hose(s). 4a. Keep hands clear from any line of fire.
	4b. FALL: Using side mounted ladder when attaching hose to tank. Slip, trip, fall from lines/hoses	4b. Inspect ladder steps to make sure steps are not bent/damaged and free of debris/fluid. 4b. Use three points of contact always when using ladder. 4b. Use hoist or other mechanical means to secure and move hose. 4b. Utilize anti-whip cords on all compressed hoses. Keep hoses and lines coiled and organized out of designated walking paths around the work zone.
	4c. CONTACT: Contamination (e.g., SPH, contaminated groundwater).	4c. Secure water hose. 4c. Do not overfill tanks, and purge/transfer liquids in such a manner that they do not splash. (See 3b). 4c. Dispose of used materials/PPE in the designated impacted PPE container.
	4d. EXERTION: Muscle strain from lifting/carrying equipment.	4d. See 2a.
	4e. FALL: Spilled purge water.	4e. Clean up any spills using absorbent pads or spill kits.
5. Decontaminate equipment	**5a. CONTACT/EXPOSURE:** Contamination (e.g., SPH, contaminated groundwater, vapors).	5a. See 3b.
	5b. EXPOSURE/CONTACT: Chemicals in cleaning solution	5b. Decontaminate equipment in well-ventilated area. Wear nitrile gloves to avoid skin contact with cleaning solutions.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-018	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description) :
GENERIC	**Construction**	**Installing and Working on Scaffolding**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Tom Henderson	Senior Scientist	Brian Hobbs	Corporate Health & Safety Manager
AJ Clare	Senior Technician		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☒ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☐ HEARING PROTECTION ☒ SAFETY SHOES: Safety-toed boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Reflective vest, Long sleeve shirt	☒ GLOVES: Leather, Level 2 Cut Resistant ☒ OTHER: Personal Fall Arrest System (PFAS) or Fall Prevention System (PFS)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Caution tape, 42"-high cones/barricades, scaffolding, ladders, signage, and hand tools.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10' exclusion zone (EZ) minimum will be maintained around scaffolding and ladders.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure work zone.	**1a. CONTACT:** Struck By pedestrian and/or vehicular traffic entering the work area. **1b. FALL:** Slip/trip/fall hazards in EZ. **1c. EXPOSURE:** Potential hazardous atmosphere. **1d. ENERGY SOURCE:** Electrocution (if applicable).	1a. Define work **EZ of 10'minimum** around scaffold construction area excluding equipment staging areas. Expand EZ for tip over distance, if needed. Use 42" cones, barricades, "Caution" tape, and warning signage. Communicate task to surrounding workers. Only designated workers donned with required standard PPE (including Level 2 cut-resistant gloves) allowed entry to EZ. 1b. Remove material and equipment obstructions from walkways and store in designated staging areas. 1c. Conduct air monitoring using direct-reading instruments. 1d. Conduct LO/TO procedures; Engage Public Utility to cover, relocate, or remove overhead electric lines prior to Work Zone entry. Follow HASP and OSHA Standard 1926.451(f)(6) for required specific clearance distances.
2. Unload scaffolding components.	**2a. CONTACT:** Lacerations, cuts, and abrasions. **2b. CAUGHT-CRUSHED:** Fingers / hands in pinch points. **2c. FALL:** Fall from height; Trip/fall while moving equipment into position. **2d. ERGONOMICS:** Strain from moving material into position.	2a. Wear ANSI Level 2 cut resistant gloves if pre-work material inspection yields sharp edges. 2b. Position your fingers/hands where they can't be caught between a lifted load and adjacent objects. Wear leather gloves to protect from pinching/crushing. 2c. Ascend/descend materials from/onto delivery truck-bed using 3-points of contact; If the truck bed does not have a built-in ladder, use an A-frame step ladder of sufficient height that the worker will not need to use the top 2 steps; 2c. Keep materials, scaffolding, and hand tools in designated staging area(s) until needed to avoid clutter and trip hazards. 2d. Use buddy system or lifting-apparatus when lifting materials over 50-lbs. Use proper lifting techniques including straight back, bent knees, load-weight near body, don't reach/extend load away while handling/moving components, avoid twisting.
3. Inspect scaffolding components prior to set-up.	**3a. FALL:** From damaged or malfunctioning scaffold components.	3a. Designate **Competent Person (CP)** for this task: _____ (insert name above). **CP** responsibilities**:** - Remains on-site for all phases of scaffold work. - Inspects scaffold components including wheels, brakes, connections, pins, framing, platforms, guard rails, and ladders per OSHA 1926 subsection L. - Trains workers to erect the scaffold structure, hazard-recognition, scaffold's safe use, fall prevention / protection, load capacities, falling objects, electrical hazards, access, maintenance, operation, repair, dis-assembly, use of ties/braces, inspection. - Uses only manufacturer-supplied braces and hardware (no substitutions). - Removes damaged components from service. - Tags scaffold to alert workers of its condition.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
4. Scaffold assembly (erecting / moving scaffolding from ground level).	**4a. CONTACT:** STRUCK-BY materials/ tools/ equipment falling from scaffold platform causing bone fractures, lacerations, cuts, abrasions.	4a. **Maintain 10' EZ** minimum or tip-over radius (where possible) around the scaffold erection area; Set up scaffolding on firm, level surfaces. Use leveling jacks to provide stable base and eliminate scaffold movement. 4a. Wheeled-base scaffold wheels to remain locked except during relocation. Workers must disembark with tools during repositioning, and then relock wheels. 4a. While working over 6ft, ensure that hand tools and equipment are securely tied off using rated rope or a lanyard to prevent contact with ground workers. 4a. Use only manufacturer-supplied braces and hardware (no substitutions). 4a. When hoisting materials overhead to workers verify rope is free of rips or tears and has appropriate weight rating. Verify materials are securely fastened with rope. 4a. Wear required PPE including hard hat, safety glasses, reflective vest, safety-toe boots, long sleeve shirt, PFAS harness with lanyard attached to approved anchor points.
	4b. CAUGHT-CRUSHED: Pinch point during scaffold assembly.	4a. Use manufacturer-approved platforms (18"-width minimum) or marked, scaffold-grade planking so that the working platform surface is filled between the front uprights and the guardrails. 4a. Gaps between the uprights/platforms/planks not to exceed 1". 4" high toe-boards are required to prevent objects from falling from decking to lower levels. 4b. Keep fingers/limbs away from pinch points and frame-work connections during assembly. Wear leather gloves for hand protection.
	4c. FALL: From Ladder / End-frame / Stair access to platform while ascending / descending Fall due to Elevated Platform Failure Fall from elevation. Fall due to Scaffold failure.	4c. Use ladder / built-in scaffolding end-frame steps / stairs to ascend and descend scaffolding, ***NOT*** cross-bracing. Ladders must be inspected, clear scaffolding platform by a 3'-minimum, and be tied-off. Maintain 1:4 slope ratio, 3-points of contact while ascending/descending, with weight centered between rails. Install swing gates at scaffold staircases (if staircases are used). 4c. Use only "Scaffold-Grade" marked planking; Planking to overlap frame-work edges 6"-12" ***only***; Install cross braces in all sections except access and material-delivery points; Scaffolding to be tied into work-face for every 30' in elevation; Working platform must be within 14" from work-face. 4c. Personal Fall Arrest Systems (PFAS) to be used above 6'; Fall protection anchor point installations (excluding the scaffold being worked from) prioritized after platform assembly and used; Calculate that fully deployed PFAS will not allow user to touch the ground during potential falls. 4c. If scaffold tiers are erected above workers *and* OSHA compliant top-rails (42"), mid-rails (21"), toe-boards (4") are employed, safety harnesses are not required; CP conducts final inspection of completed scaffold structure prior to use verifying correct assembly/securement, pins are in "locked" position.
	4d. EXERTION: Muscle strain while moving/lifting materials.	4d. Employ buddy system or lifting-apparatus when lifting materials over 50-lbs; Use proper lifting techniques including straight back, bent knees, load/weight near body, don't reach/extend/twist with load while handling components.
	4e. ENERGY SOURCE: Electrocution (if applicable)	4e. Verify that no energy sources (electric wires, cables) either contact scaffolding or come within OSHA/HASP specified distances of workers or scaffold. Use LO/TO to ensure that hazardous energy cannot be transmitted to the conductive scaffold framework prior to assembly.
5. Working on scaffolding.	**5a. CONTACT:** Struck-by objects falling from scaffolding / ladder.	5a. See JOB STEP 4a; Remove unnecessary tools/materials from scaffolding, returning them to designated staging areas. Inspect work zone for head-knocker and trip hazards.
	5b. FALL: Fall from elevation. Fall during scaffold collapse due to overloading. Slip/fall due to slick surfaces.	5b. See JOB STEP 4c; **CP** to conduct daily, pre-work, scaffold inspection; Workers climbing on scaffolding will use 3-points of contact; Ensure PFAS lanyards secured to approved anchor points (excluding the scaffold being worked from, or other scaffold-framework-struts). **CP** to review manufacturer's weight-loading specifications / restrictions for workers and materials, communicate limitations to the work crew, and periodically verify adherence to the specifications. **CP** and workers to inspect/assess for slick, wet, or iced (outdoor) surfaces continually during use due to changing conditions, mitigate hazards, and/or restrict access and post warnings.
6.Disassemble scaffolding.	**6a. CONTACT:** Struck-by falling tools / materials.	6a. Clear scaffolding of debris, tools, and materials prior to dismantling; Dismantle scaffolding by working backwards from the farthest point towards the access location; Plan/verify a route of egress prior to dismantling.
	6b. FALL: Slip/trip hazards resulting from inadequate house-keeping.	6b. Remove fall protection (mid-rail, top-rail) only after removing cross braces; Ensure that all personnel are aware that the particular tier of scaffolding is being dismantled; If fall protection anchor points have been removed, maintain safe distances from scaffolding platform edges, and only under a Supervisor's observation.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-019	DATE: 8/6/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Recon**	**Site Walk and Inspection**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Sara Barrientos	Staff Geologist	Brian Hobbs	Corporate Health and Safety Manager
		Joe Duminuco	Vice President

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: ear plugs as necessary ☒ SAFETY SHOES: Steel or composite toed	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High-visibility vest or high-vis outerwear	☒ GLOVES: Leather/cut-resistant/chemical resistant ☒ OTHER: Tyvek and rubber boots as necessary, dust mask as necessary

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Site map, emergency contact list, documentation of urgent care/hospital routes and / or guide familiar with Site, operating cell phone or walkie-talkie if Site allows.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE (EZ): A minimum 10' exclusion zone will be maintained around equipment.

SITE SECURITY: Prior to site inspection verify appropriate method to address Site Security concerns as it relates to potential criminal activity, homeless population, and/or isolation concerns. Work with the Project Principal and/or Project Manager to address appropriately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site contact.	**1a. CONTACT/EXPOSURE/FALL:** Personal injury caused by lack of site specific hazards.	1a. Inquire about hazards and other activities taking place at the Site. 1a. Inform Site contact of work scope, timeline and location(s). 1a. Discuss emergency evacuation procedures and muster points with Site contact.
2. Traversing the Site	**2a. CONTACT:** Property damage and personal injury caused by obstructions/vehicles or unauthorized personnel at remote Sites.	2a. All equipment must be stowed and secured prior to moving. 2a. Maintain speed limit as posted on-site. 2a. When possible drive on established roadways. 2a. Yield to all pedestrians. 2a. Use pull-through spots or back into parking spots. 2a. Don high visibility clothing/safety vest. If working at remote Site, add orange accessories during hunting season.
	2b. FALL: Uneven terrain and weather conditions. Overgrown shrubs and vines. Equipment in the work zone.	2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2b. When possible, use established pathways and walk on stable, secure ground. 2b. Communicate traversing hazards with others.
	2c. OVEREXERTION: Muscle strain while carrying equipment.	2c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use mechanical assistance or make multiple trips to carry equipment.
	2d. EXPOSURE: Biological hazards – ticks; bees/wasps; poison ivy; insects; (Ticks are most active any time the temperature is above freezing, typically from March to November.)	2d. Inspect area to avoid contact with biological hazards. 2d. Ticks: • Treat outer clothing including pants, shirts, socks, boots and hats the evening before with Permethrin (allowing at least two hours before use). • Apply DEET to exposed skin before travelling to the Site and reapply after two hours. • Check for ticks during and after work. 2d. Bees: • Use bee spray as appropriate to deter/eliminate bees. • Protect exposed skin with insect repellent. 2d. Poison Ivy:

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	2e. EXPOSURE: Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	• Identify areas of poison ivy and spray with weed killer. Don Tyvek and rubber boots while traversing poison ivy areas. • If skin contacts poison ivy, wash skin thoroughly with soap and water. 2e. Wear sunscreen with SPF 15 or greater on exposed skin whenever 30 minutes or more of sun exposure is expected. 2e. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 2e. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 2e. Wear appropriate rain gear as needed. 2e. Take frequent breaks if tired, wet, or cold/hot. Drink water. 2e. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
3. Walking near heavy equipment and machinery.	**3a. CONTACT:** Personal injury from Site and roadway traffic. Personal injury from flying debris **3b. OVEREXERTION:** Personal injury from lifting/moving/rotating equipment. **3c. EXPOSURE:** Hearing damage from noise generating equipment/processes. Inhalation/exposure to hazardous vapors and or dust. **3d. EXPOSURE:** Working in a remote area.	3a. See 2a. 3a. Maintain an exclusion zone of at least 10'-25' feet from all engaged equipment. 3a. Keep body parts out of the line of fire of pinch points. 3a. Wear appropriate PPE always. 3b. See 2c. 3c. Wear hearing protection if >85 dBA. (i.e. noise levels which require you to raise your voice to communicate) 3c. Always wear leather gloves when handling any tools or equipment. 3c. Always wear appropriate PPE based off chemicals present. 3d. Use the "buddy system" whenever possible. If working alone, contact PM upon arrival/departure, as well as during work activities prior to commencing work if applicable. 3d. Always carry a communication (i.e., cell phone, walkie-talkie) or directional (i.e., map, compass, etc.) device when traversing remote areas.
4. Working in adverse weather conditions.	**4a. EXPOSURE:** Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	4a. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 4a. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 4a. Wear appropriate rain gear as needed. 4a. Take frequent breaks if tired, wet, or cold/hot. Drink water. 4a. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
5. Departing Site.	**5a. EXPOSURE:** Exposure to unnecessary hazards should personnel believe Roux is on-Site during an emergency and conduct a search.	5a. Sign out or notify Site contact and Roux Project Manager of your departure.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-021	DATE: 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE	WORK ACTIVITY (Description)	
GENERIC	**Gauging and Sampling**	**Soil Vapor Sampling (Permanent Monitoring Points)**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Jeff Wills	Project Hydrogeologist	Brian Hobbs	Corporate Health and Safety Manager
Julie Moriarity	Project Scientist		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant & Nitriles
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☒ OTHER: Bug Spray, Sun Screen, Knee Pads or kneeling pad
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel-toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

9/16" Socket and Wrench, Non-Toxic Clay, Teflon-Lined Tubing, Masterflex Tubing, Air Pump with Low Flow, Dry Cal, Enclosure (Bucket with 2 holes), Helium Gas Canister, Summa Canisters and Flow Controllers, MultiRae Photo Ionization Detector (PID), Helium Detector, Tubing Cutter, 42-inch Safety Cones, Caution Tape or Retractable Cone Bars

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): A 5-foot exclusion zone will be maintained for non-essential personnel.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Define and secure work area.	**1a. FALL:** Potential tripping hazards.	1a. Ensure work area is secure and inform others (third party) of work activity. 1a. Remove tripping hazards and inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment.
	1b. CONTACT: Potential contact with moving vehicles or pedestrians.	1b. If working alongside roads, look both ways before entering roadways, face traffic, and utilize work vehicle to protect employees. 1b. Delineate work area (including vehicles) with traffic safety cones and caution tape or retractable cone bars. 1b. Maintain a 5-foot exclusion zone. 1b. Wear high visibility clothing or reflective safety vest.
	1c. EXERTION: Muscle strain while lifting and carrying equipment.	1c. When carrying equipment to/from work area, keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced. Use mechanical assistance/make multiple trips to carry equipment.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Remove well cover / close well cover.	**2a. CONTACT/CAUGHT:** Pinch points and scrapes associated with hand tools and well covers. **2b. FALL:** Potential tripping hazards associated with installing bolts. **2c. EXERTION:** Physical exertion to remove bolts that were over torqued or stripped.	2a. Keep hands away from pinch points. 2a. Use hand tools with extensions to remove and replace well covers. 2a. Wear cut-resistant gloves. 2a. Use knee pads or kneeling pad when repetitive kneeling on rough ground is anticipated. 2b. Place security bolts in secure location so not to create tripping hazards. Replace security bolts so that they fit flush with monitoring well covers. 2c. Replace any security bolts that show signs of stripping. Do not over tighten. 2c. Use body positioning and bending techniques that minimize muscle strain; keep back straight, bend at the knees. 2c. See 2a.
3. Screen vapor point with PID.	**3a. FALL:** Potential tripping hazards associated with equipment. **3b. EXPOSURE:** Inhalation of soil vapor	3a. Place equipment in one area close to the sampling location. 3b. Identify area where equipment is to be stored within the work area (away from main walking path). 3a. Don't leave equipment on the ground. Return equipment to storage area between uses. 3b. Replace brass caps immediately upon completion to avoid soil vapors migrating to the surface through sample tubing. 3b. Stand upwind of sample point during screening activities.
4. Remove / replace brass caps at the end of the sam`ple tubing.	**4a. CONTACT:** Pinch points associated with hand tools and brass caps. **4b. EXPOSURE:** Potential pathway for vapors to migrate to land surface.	4a. Use wrench to remove and replace brass caps. 4a. Wear cut-resistant gloves to protect against pinch points and scrapes. 4b. See 3b. 4b. Stand up wind of sample point location.
5. Set up soil vapor sampling equipment and calibration of meters.	**5a. FALL:** Potential tripping hazards associated with equipment and tubing.5b. **5b. CONTACT:** Pinch points associated with handling equipment. **5c. EXPOSURE:** Inhalation of calibration gas and helium.	5a. See 3a. 5a. Keep tubing slack to a minimum and locate the summa canister as close to the sampling location as possible. 5a. Avoid stepping over equipment and tubing. 5b. Do not place fingers/hands under sampling equipment. 5b. Make multiple trips when unloading equipment in work area. 5b. Wear cut-resistant gloves to protect against pinch points while handling sampling equipment. 5c. Review SDS for each type of calibration gas used before calibrating. 5c. Calibrate meters in a well-ventilated area and keep air flow regulator away from face. 5c. Close valve on canisters after use to avoid inhalation of excess helium or calibration gas. 5c. Stand up wind of bucket during helium tracer gas test.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
6. Cleaning Work Area.	**6a. FALL:** Potential tripping hazards associated with equipment and tubing.	6a. See 3a. 6a. See 3b.
	6b. CONTACT: Storing and transport of equipment in car.	6b. Ensure that equipment is placed securely in the vehicle. Do not stack equipment on top of each other. Secure equipment so that it will not slide while being transported. 6b. Wear cut-resistant gloves while handling/loading equipment.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-022	DATE 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
General	**Drilling**	**Rotosonic Soil Borings / Well Installation**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
William Poupis	Vice President ADT	Brian Hobbs	Corporate Health & Safety Manager
Amy Hoffmann	Project Geologist		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES steel or composite toe	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: fluorescent long sleeve shirt or long sleeve shirt and reflective safety vest.	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Truck-Mounted Sonic Drilling Rig or Mini Sonic Rig, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Interface Probe, 20 lb. Type ABC Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs, Water

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A minimum 10' exclusion zone will be maintained around equipment.

"SHOW ME YOUR HANDS"
Driller and helper should show that hands are clear from controls and moving parts

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization of drilling rig (ensure the Subsurface Clearance Protocol and Drill Rig Checklist are completed). **See also Mobilization/Demobilization JSA.**	**1a. CONTACT/CRUSH:** Equipment/property damage during movement. Crush point between moving rig and other objects.	1a. The drill rig's tower/derrick will be lowered and secured prior to mobilization. 1a. A spotter should be utilized while moving the drill rig or backing operations. If personnel move into the path of the drill rig, the drill rig will be stopped until the path is again clear. 1a. Set-up the work area and position equipment in a manner that eliminates or reduces the need for backing of support trucks and trailers. 1a. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver/spotter visibility. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1a. Drill rig should have a **minimum exclusion zone of 10 feet** for non-essential personnel (i.e., geologist) when the rig is moving/in operation.
	1b. FALL: Slip/trip/fall hazards.	1b Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1b. Use established pathways and walk on stable, secure ground.
2. Raising tower/derrick of drill rig.	**2a. CONTACT**: Overhead hazards.	2a. Prior to raising the tower/derrick, the area above the drilling rig will be inspected for overhead utilities, tree limbs, piping, or other structures, that could come in contact with the rig's tower and/or drilling rods or tools. 2a. Site requirements for raising a tower/derrick around overhead utilities must be reviewed prior to drilling. Maintain **a minimum distance of 10 feet** from overhead structures. 2a. The tower/derrick must not be raised beneath overhead power lines unless approved by both the Roux and Project PMs.
	2b. CONTACT: Amputation points when raising the rig and instability of rig.	2b. Inspect the equipment prior to use and avoid amputation points when engaging tower/derrick. 2b. Lower outriggers to ensure stability prior to raising rig tower/derrick. 2b. If the rig needs to be mounted, be sure to use three points of contact.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Advancement of soil boring and well installation. **See also Soil Sampling JSA.**	**3a. CONTACT**: Flying debris.	3a. Be aware of and avoid potential lines of fire and wear required PPE such as eye, ear, and hand protection.
	3b. EXPOSURE: Noise and dust.	3b. Wet borehole area with sprayer to minimize dust. 3b. Stand upwind and keep body away from rig. 3b. Dust mask should be worn if there is visible dust in the breathing zone. 3b. Wear hearing protection when the drill rig is in operation.
	3c. CAUGHT: Limb/extremity amputation points; abrasion/crushing.	3c. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 3c. Inspect the equipment prior to use for potential amputation points. Keep hands away from being between connections and use of tools is preferable compared to fingers and hands. 3c. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3c. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3c. All non-essential personnel should remain outside the heavy equipment exclusion zone that is at least as far as the boom is high (**minimum exclusion zone of 10 feet**). 3c. Drillers and helpers will understand and use the “Show Me Your Hands” Policy. Operator and helpers will remain a **minimum of 3 feet** from augers/drill rods while in operation.
	3d. CONTACT/CRUSH: Crushed between equipment due to imbalance during advancement of drill equipment.	3d. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and/or tip. 3d. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. 3d. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (**minimum exclusion zone of 10 feet**).
	3e. EXPOSURE: Inhalation of contamination/vapors.	3e. Air monitoring using a calibrated photoionization detector (PID) will be used to periodically monitor the breathing zone of the work area. 3e. If readings of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional precautions in accordance with the site-specific health and safety plan.
	3f. FALL: Slip/trip/fall hazards.	3f. Contain drill cuttings and drilling water to prevent slip/trip/fall hazards from developing in work area. 3f. See 1b.
	3g. EXERTION: Potential for muscle strain/injury while installing well casings and/or lifting sonic rods/casings.	3g. Keep back straight and bend at the knees. 3g. Utilize team lifting for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.
4. Decontaminate equipment.	**4a. EXPOSURE:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors, chemical in cleaning supplies).	4a. Wear chemical-resistant gloves and safety glasses. 4a. Contain decontamination water so that it does not spill. 4a. Use an absorbent pad to clean spills, if necessary. 4a. See 3b.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-023	DATE: 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)	
Generic	**Construction**	**Spotting Heavy Machinery**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Levi Curnutte	Project Scientist	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ Particulate Respirator	☒ GLOVES: Cut resistant / leather
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER:
☒ LONG SLEEVED SHIRT	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-/Composite-toe boots/shoes		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Heavy Machinery (i.e. excavator, payloader, truck, forklift, etc.)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around heavy equipment. Larger equipment with an increased operating or tip-over radius may need a larger exclusion zone. This should be defined prior to operating each piece of equipment

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Prepare for machine activity.	**1a. CONTACT:** Obstructions in the work area may create contact hazards from machinery.	1a. Cordon off the work area with safety barrels/cones and a rigid barrier (snow fence, traffic bar, etc.). Communicate that only necessary personnel should be in the work area. Spotter and equipment operator shall enforce the **10-ft (exclusion zone) EZ.** Operator will not operate but shall remain in the hands-off mode while personnel are within the exclusion zone.
	1b. Fall : Slip/Trip/Fall	1b. Ensure that work area is flat, level and clear of any obstructions or debris before setting up work zone.
2. Spotting.	**2a. CONTACT:** Machine or load contact with personnel, property, or machinery.	2a. Discuss the specifics of the work with the operator and be clear about any hand signals that will be used. Clearly discuss the limits of the assigned work area and the machine's Exclusion Zone. Maintain Exclusion Zone. The Exclusion Zone shall be delineated by using 42-inch traffic cones/barrels and a fixed rigid barrier. 2a. The Minimum Heavy Equipment Exclusion zone is 10ft. if it is a larger piece of equipment or has an increased swing or tip-over radius the exclusion zone will need to be increased to accommodate the full range of motion. 2a. Both the spotter and equipment operators shall have 2-way radios/cellular devices on their persons to ensure audible communication in the event any changes or new hazards may arise. 2a. All workers should stay outside of the Exclusion Zone of all equipment unless operator is stopped and in "Hands Off" mode. **(This includes the spotter unless an exception has been established in the Site-specific JSA).** If the Exclusion Zone must be reduced due to work area restrictions then the spotter and operator shall enforce the reduced Exclusion Zone. 2a. Spotters must make eye contact with the machine operator or all movement ceases until visual contact can be reestablished. 2a. Spotter shall keep an eye out for any issues with the machine the operator may not see and communicate with other work crews and spotters on behalf of the operator. 2a. If the spotter needs to take a break, he must find a replacement before leaving or have the machine stop operations. **No heavy equipment shall operate without a spotter under any circumstances.** 2a. Wear fluorescent clothing/safety vest.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
	2b. FALL: Slip/Trip/Fall	2b. Look where walking to identify and avoid slip/trip/fall hazards. Avoid icy and/or wet surfaces. Remove obstacles if possible. 2b. Use designated walkways during spotting whenever possible.
	2c. CAUGHT: Caught between machinery and nearby objects.	2c. **Maintain Exclusion Zone.** Do not stand between large, loose or fixed objects or structures and the machinery while it is in motion. Keep in sight of operator at all times while being aware of surrounding structures.
	2d. EXPOSURE: Inhalation of exhaust from machinery.	2d. The spotter will position him/herself upwind of the working machinery, when possible. Spotter will also inform others working within the vicinity of the EZ of proper positioning, if applicable.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-025	DATE: 8/6/2018	☐ NEW ☒ REVISED	PAGE 1 of 1

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)	
Generic	**General**	**Trucking**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Lauren Dolginko	Project Geologist	Brian Hobbs	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather or cut resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LONG SLEEVED SHIRT	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility long sleeved clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-toe boots		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Heavy equipment (i.e. trucks)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in Hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE: A 10' minimum exclusion zone will be maintained around excavator, backhoe, dump trucks and other heavy equipment.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Set up work zone.	**1a. CONTACT:** Personal injury/property damage caused by obstruction/vehicle.	1a. Establish work zone for manifesting/paperwork by communicating with workers before task begins. Maintain a **10 ft Exclusion Zone (EZ)** around all heavy equipment.
2. Loading of truck.	**2a. CONTACT:** Rolling Vehicle could cause bodily harm. **2b. CONTACT:** Machine or load may crush personnel, property or machinery. **2c. CONTACT:** Load shifting during travel.	2a. All commercial vehicles without an operator must have their engines off and wheels chocked. Truck and loading area should be on level ground. 2b. All machines (Excavator, Lull, Backhoe) must have a spotter. Spotter must communicate contact hazards such as other personnel in the work area, objects in the machine's blind spot, and overhead lines to the operator. Spotter and operator should have 2-way radios or established hand signals to communicate when needed. 2b. Loads must not be swung over other vehicles or personnel. 2b. Maintain **10ft EZ** around all equipment. 2c. Secure all loads prior to moving the truck with chains or straps or cribbing. 2c. Any loose soil or debris should be cleaned off truck sides prior to truck mobilization. 2c. All truck beds must be secured prior to traveling.
3. Dumping loads.	**3a. CONTACT:** Truck may flip sideways or backwards.	3a. All workers must stay behind and away from the side of trucks that are dumping to avoid contact with the truck potentially tipping sideways or backwards. EZ must be maintained equal to the height of bed while lifted.
4. Exchanging paperwork with truck driver.	**4a. CONTACT/CAUGHT:** Broken bones from contact by vehicle. **4b. FALL:** Slip, Trip or Fall may cause muscle strains or tears, abrasions or lacerations, or broken bones.	4a. Truck driver should exit truck with proper PPE and enter the established work zone to complete paperwork. If Site-specific safety prohibits drivers from exiting the truck, wait until truck is finished loading, with engine turned off, before approaching truck. 4a. Always establish eye contact with driver prior to approaching truck. 4a. Confirm sides of truck have been cleaned/brushed off prior to approaching truck. 4b. Survey walking route to identify slip/trip/fall hazards. Avoid icy/wet surfaces. Remove slip/trip/fall hazards if present. 4b. Communicate with driver and spotter prior to approaching truck. Maintain a **10 ft EZ** around all heavy equipment.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards, energy source; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

APPENDIX B

SDSs for Chemicals Used

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer
Alconox, Inc.
30 Glenn Street
White Plains, NY 10603
1-914-948-4040

Supplier
Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.

Seek medical attention if irritation, discomfort, or vomiting persists.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

8 Exposure controls/personal protection

8.1 Control parameters :

7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower:** **Explosion limit upper:**	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C:**	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density:**	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density:**	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities:**	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water):**	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature:**	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature:**	Not determined or not available.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

Class: None
Label: None
LTD. QTY: None

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:**	Not applicable.
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

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Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0

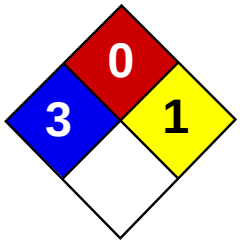
Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

HMIS: 1-0-0



Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

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. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. 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 the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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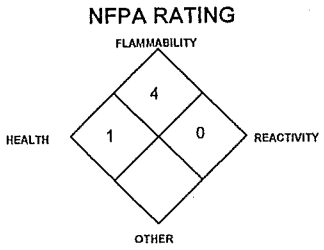
Last Updated: 05/21/2013 12:00 PM

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards



PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS:	**ISOBUTYLENE - C_4H_8** Document Number: Isobutylene
PRODUCT USE:	For general analytical/synthetic chemical uses.
SUPPLIER/MANUFACTURER'S NAME: ADDRESS:	MESA Specialty Gases & Equipment 3619 Pendleton Avenue, Suite C Santa Ana, CA 92704
BUSINESS PHONE: EMERGENCY PHONE:	1-714-434-7102 INFOTRAC: 1-800-535-5053
DATE OF PREPARATION:	May 10, 1999

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Isobutylene	115-11-7	> 99.0%	There are no specific exposure limits for Isobutylene. Isobutylene is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					
Maximum Impurities		< 1.0%	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Isobutylene is a colorless, liquefied, flammable gas with an unpleasant odor similar to burning coal. The liquefied gas rapidly turns into a gas at standard atmospheric temperatures and pressures. Isobutylene is an asphyxiant and presents a significant health hazard by displacing the oxygen in the atmosphere. Rapid evaporation of liquid from the cylinder may cause frostbite. Both the liquid and gas pose a serious fire hazard when accidentally released. The gas is heavier than air and may travel to a source of ignition and flash back to a leak or open container. Flame or high temperature impinging on a localized area of a cylinder of Isobutylene can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for this gas is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: High concentrations of this gas can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of overexposure, death may occur. Isobutylene also has some degree of anesthetic action and can be mildly irritating to the mucous membranes. The effects associated with various levels of oxygen are as follows:

CONCENTRATION	SYMPTOMS OF EXPOSURE
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea and vomiting, collapse or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

OTHER POTENTIAL HEALTH EFFECTS: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	1
FLAMMABILITY	(RED)	4
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Overexposure to Isobutylene may cause the following health effects:

ACUTE: The most significant hazard associated with this gas is inhalation of oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, headache, dizziness, and nausea. At high concentrations, unconsciousness or death may occur. Contact with liquefied gas or rapidly expanding gases may cause frostbite.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to Isobutylene.

TARGET ORGANS: Respiratory system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO ISOBUTYLENE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations.

4. FIRST-AID MEASURES (Continued)

Remove victim(s) to fresh air as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

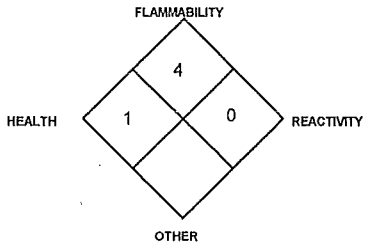
Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES

FLASH POINT (Closed Cup): -10°C (< 14°F)
AUTOIGNITION TEMPERATURE: 465°C (869°F)
FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 1.8%
Upper (UEL): 9.6%

NFPA RATING



See Section 16 for Definition of Ratings

FIRE EXTINGUISHING MATERIALS: Extinguish Isobutylene fires by shutting off the source of the gas. Use water spray or a foam agent to cool fire-exposed containers, structures, and equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this material may ignite and produce toxic gases, including carbon monoxide and carbon dioxide.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of Isobutylene can be very dangerous. Direct flame exposure on the cylinder wall can cause an explosion either by BLEVE (Boiling Liquid Expanding Vapor Explosion), or by exothermic decomposition. This is a catastrophic failure of the vessel releasing the contents into a massive fireball and explosion. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the vessel. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Static discharge may cause Isobutylene to ignite explosively if released.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation (in enclosed areas) to prevent flammable or explosive mixture formation. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Because of the potential for a BLEVE, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of vessel exposures, evacuate the area. Refer to the North American Emergency Response Guidebook for additional information. Other information for pre-planning can be found in the American Petroleum Institute Publications 2510 and 2510A.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided. Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, gloves resistant to tears, and Self-Contained Breathing Apparatus.**

Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut off with water spray. Allow the gas to dissipate. Monitor the surrounding area for combustible gas levels and oxygen. Combustible gas concentration must be below 10% of the LEL (LEL = 1.8%) prior to entry. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area and allow the gas to be released there.

THIS IS AN EXTREMELY FLAMMABLE GAS. Protection of all personnel and the area must be maintained.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Isobutylene IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of Isobutylene could occur without any significant warning symptoms.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Post "No Smoking or Open Flames" signs in storage or use areas.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Isolate from oxidizers such as oxygen, chlorine, or fluorine. Use a check valve or trap in the discharge line to prevent hazardous backflow. Post "No Smoking or Open Flame" signs in storage and use areas. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand truck. Do not drag, slide, or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap, if provided, in place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap, if provided. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Isobutylene. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 "*Oxygen Deficient Atmospheres*".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (e.g., nitrogen) before attempting repairs.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Isobutylene dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the presence of potentially explosive air-gas mixtures and level of oxygen.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% in the workplace. Maintain level of gas below the level listed in Section 2 (Composition and Information on Ingredients). Use supplied air respiratory protection if oxygen levels are below 19.5% or during emergency response to a release of Isobutylene. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards.

EYE PROTECTION: Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of liquid Isobutylene.

HAND PROTECTION: Wear gloves resistant to tears when handling cylinders of Isobutylene. Use low-temperature protective gloves (e.g., Kevlar) when working with containers of liquid Isobutylene.

BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product, as well as fire retardant items.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY @ 21.1°C (70°F): 2.396 kg/m^3 (0.1496 lb/ft^3)
SPECIFIC GRAVITY (air = 1): 1.997
SOLUBILITY IN WATER: Insoluble.
EVAPORATION RATE (nBuAc = 1): Not applicable.
ODOR THRESHOLD: Not established.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
pH: Not applicable.
FREEZING POINT: -140°C (-220.6°F)
BOILING POINT @ 1 atm: -6.9°C (19.6°F)
EXPANSION RATIO: Not applicable
VAPOR PRESSURE (psia): 39
SPECIFIC VOLUME (ft^3/lb): 6.7

APPEARANCE AND COLOR: Colorless gas with the unpleasant odor of burning coal. The liquid is also colorless and has the same unpleasant odor of burning coal.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: When ignited in the presence of oxygen, this gas will burn to produce carbon monoxide and carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers (e.g., chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks, and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture or burst.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is for pure Isobutylene.

ISOBUTYLENE:
LC_{50} (rat, inhalation) = 620 g/m^3/4 hours
LC_{50} (mouse, inhalation) = 415 g/m^3/2 hours

SUSPECTED CANCER AGENT: Isobutylene is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, and therefore is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Isobutylene may be mildly irritating to the mucous membranes. In addition, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION TO THE PRODUCT: Isobutylene is not known to cause sensitization in humans.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Isobutylene on the human reproductive system.

Mutagenicity: No mutagenic effects have been described for Isobutylene.
Embryotoxicity: No embryotoxic effects have been described for Isobutylene.
Teratogenicity: No teratogenic effects have been described for Isobutylene.
Reproductive Toxicity: No reproductive toxicity effects have been described for Isobutylene.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e., within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by overexposure to Isobutylene.

11. TOXICOLOGICAL INFORMATION (Continued)

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary. Treat symptoms and eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Isobutylene.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen-deficient environments. No adverse effect is anticipated to occur to plant life, except for frost produced in the presence of rapidly expanding gases. See Section 11, Toxicological Information, for additional information on effects on animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of Isobutylene on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to MESA Specialty Gases & Equipment Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

For Isobutylene Gas:

PROPER SHIPPING NAME:	Isobutylene
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1055
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

Alternate Description:

PROPER SHIPPING NAME:	Petroleum gases, liquefied
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1075
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

MARINE POLLUTANT: Isobutylene is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Isobutylene is not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

CANADIAN DSL/NDSL INVENTORY STATUS: Isobutylene is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Isobutylene is listed on the TSCA Inventory.

15. REGULATORY INFORMATION (Continued)

OTHER U.S. FEDERAL REGULATIONS: Isobutylene is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 lb. Depending on specific operations involving the use of Isobutylene, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Isobutylene is not listed in Appendix A; however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lb (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.

U.S. STATE REGULATORY INFORMATION: Isobutylene is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Liquefied Petroleum Gas.
California - Permissible Exposure Limits for Chemical Contaminants: Liquefied Petroleum Gas.
Florida - Substance List: Isobutylene.
Illinois - Toxic Substance List: No.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Isobutylene.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: Liquefied Petroleum Gas.
Missouri - Employer Information/Toxic Substance List: No.
New Jersey - Right to Know Hazardous Substance List: Isobutylene.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Isobutylene.
Rhode Island - Hazardous Substance List: Liquefied Petroleum Gas.
Texas - Hazardous Substance List: Liquefied Petroleum Gas.
West Virginia - Hazardous Substance List: Liquefied Petroleum Gas.
Wisconsin - Toxic and Hazardous Substances: Liquefied Petroleum Gas.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Isobutylene is not on the California Proposition 65 lists.

LABELING:

DANGER:

FLAMMABLE LIQUID AND GAS UNDER PRESSURE.
CAN FORM EXPLOSIVE MIXTURES WITH AIR.
MAY CAUSE FROSTBITE.

Keep away from heat, flames, and sparks.
Store and use with adequate ventilation.
Cylinder temperature should not exceed 52°C (125°F).
Do not get liquid in eyes, on skin, or clothing.
Close valve after each use and when empty.
Use in accordance with the Material Safety Data Sheet.

FIRST AID:

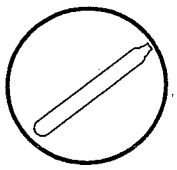
IF INHALED, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

IN CASE OF FROSTBITE, obtain immediate medical attention.

DO NOT REMOVE THIS PRODUCT LABEL.

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas
Class B1: Flammable Gas



16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. MESA Specialty Gases & Equipment assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, MESA Specialty Gases & Equipment assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.
OSHA - U.S. Occupational Safety and Health Administration. **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration **(OSHA)**. NIOSH issues exposure guidelines called Recommended Exposure Levels **(RELs)**. When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:
HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).
NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued): Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:
Much of the information related to fire and explosion is derived from the National Fire Protection Association **(NFPA)**. Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo, LDLo**, and **LDo**, or **TC, TCo, LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:
This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations.

Manufactured for

INDUSTRIAL SCIENTIFIC

CORPORATION

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MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas: Oxygen, 0.0015-23.5%; Propane, 0-1.1%; n-Pentane, 0-0.75%; n-Hexane; 0-0.48%; Carbon Monoxide, 0.0005-1.0%; Hydrogen Sulfide, 0.001-0.025%

NOTE: MIXTURES COMPRISED OF AN AIR BALANCE GAS CONTAIN BETWEEN 19.5-23.5% OXYGEN.

SYNONYMS: Not Applicable

CHEMICAL FAMILY NAME: Not Applicable

FORMULA: Not Applicable

Document Number: 50016 (Replaces ISC MSDS No.1810-2187, 1810-2343, 1810-3366, 1810-3937 1810-7219, 1810-7599, 1810-6179)

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER/MANUFACTURER'S NAME:	CALGAZ
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
General MSDS Information	1-713/868-0440
Fax on Demand:	1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIHTLV		OSHA		IDLH	OTHER
			TWA ppm	STEL ppm	TWA ppm	STEL ppm	ppm	ppm
Oxygen	7782-44-7	0.0015 - 23.5%	There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5%.					
Propane	74-98-6	0 - 1.1%	2500	NE	1000	NE	2100	NIOSH REL: 1000 DFG MAK: 1000 ppm
n-Pentane	109-66-0	0 - 0.75%	600	750	1000 600 (Vacated 1989 PEL)	750 (Vacated 1989 PEL)	1500	NIOSH REL: TWA = 120 STEL = 610 (ceiling) 15 minutes DFG MAKs: TWA =1000 PEAK = 2•MAK, 60 min., momentary value
n-Hexane	110-54-3	0 - 0.48%	50	NE	500 50 (Vacated 1989 PEL)	NE	1100	NIOSH REL: 50 DFG MAK: 50
Hydrogen Sulfide	7783-06-4	0.001-0.025 %	10 NIC = 5	15 NIC = 5	10 (Vacated 1989 PEL)	20 (ceiling), 50 (10 min. peak, once per shift) 15 (Vacated 1989 PEL)	100	NIOSH REL: STEL = 10 (ceiling), 10 minutes DFG MAKs: TWA = 10 PEAK = 2•MAK, 10 min., momentary value
Carbon Monoxide	630-08-0	0.0005 - 1.0%	25	NE	50 35 (Vacated 1989 PEL)	200 (ceiling) (Vacated 1989 PEL)	1200	NIOSH RELs: TWA = 35 STEL = 200 ceiling DFG MAKs: TWA = 30 PEAK = 2•MAK, 15 min., average value, 1 hr interval DFG MAK Pregnancy Risk Classification: B
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established. NIC = Notice of Intended Change See Section 16 for Definitions of Terms Used.

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This gas mixture is a colorless gas which has a rotten-egg odor (due to the presence of Hydrogen Sulfide). The odor cannot be relied on as an adequate warning of the presence of this gas mixture, because olfactory fatigue occurs after over-exposure to Hydrogen Sulfide. Hydrogen Sulfide and Carbon Monoxide (another component of this gas mixture) are toxic to humans in relatively low concentrations. Over-exposure to this gas mixture can cause skin or eye irritation, nausea, dizziness, headaches, collapse, unconsciousness, coma, and death. The Propane, n-Pentane, and n-Hexane components can cause anesthetic or peripheral neuropathy effects. Additionally, releases of this gas mixture may produce oxygen-deficient atmospheres (especially in small confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. A significant health hazard associated with this gas mixture is the potential of inhalation of Hydrogen Sulfide, a component of this gas mixture. Such over-exposures may occur if this gas mixture is used in a confined space or other poorly-ventilated area. Over-exposures to Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to this component can result in respiratory arrest, coma, or unconsciousness. Continuous inhalation of low concentrations of Hydrogen Sulfide may cause olfactory fatigue, so that the odor is no longer an effective warning of the presence of this gas. A summary of exposure concentrations and observed effects are as follows

CONCENTRATION OF HYDROGEN SULFIDE	OBSERVED EFFECT
0.3-30 ppm	Odor is obvious and unpleasant.
50 ppm	Eye irritation. Dryness and irritation of nose, throat.
Slightly higher than 50 ppm	Irritation of the respiratory system.
100-150 ppm	Temporary loss of smell.
200-250 ppm	Headache, vomiting nausea. Prolonged exposure may lead to lung damage. Exposures of 4-8 hours can be fatal.
300-500	Swifter onset of symptoms. Death occurs in 1-4 hours.
500 ppm	Headache, excitement, staggering, and stomach ache after brief exposure. Death occurs within 0.5 - 1 hour of exposure.
> 600 ppm	Rapid onset of unconsciousness, coma, death.
> 1000 ppm	Immediate respiratory arrest.
NOTE:	This gas mixture contains a maximum of 250 ppm Hydrogen Sulfide. The higher concentration values here are presented to delineate the complete health effects which have been observed for humans after exposure to Hydrogen Sulfide.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	3
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
See Section 8			

For Routine Industrial Use and Handling Applications

Inhalation over-exposures to atmospheres containing more than the Threshold Limit Value of Carbon Monoxide (25 ppm), another component of this gas mixture, can result in serious health consequences. Carbon Monoxide is classified as a chemical asphyxiant, producing a toxic action by combining with the hemoglobin of the blood and replacing the available oxygen. Through this replacement, the body is deprived of the required oxygen, and asphyxiation occurs.

Since the affinity of Carbon Monoxide for hemoglobin is about 200-300 times that of oxygen, only a small amount of Carbon Monoxide will cause a toxic reaction to occur. Carbon Monoxide exposures in excess of 50 ppm will produce symptoms of poisoning if breathed for a sufficiently long time. If this gas mixture is released in a small, poorly ventilated area (i.e. an enclosed or confined space), symptoms which may develop include the following:

CONCENTRATION OF CARBON MONOXIDE	OBSERVED EFFECT
All exposure levels: ..	Over-exposure to Carbon Monoxide can be indicated by the lips and fingernails turning bright red.
200 ppm:	Slight symptoms (i.e. headache) after several hours of exposure.
400 ppm:	Headache and discomfort experienced within 2-3 hours of exposure.
1,000 -2000 ppm:	Within 30 minutes, slight palpitations of the heart occurs. Within 1.5 hours, there is a tendency to stagger.
200-2500 ppm:	Within 2 hours, there is mental confusion, headaches, and nausea. Unconsciousness within 30 minutes.
> 2500 ppm:	Potential for collapse and death before warning symptoms.

Another hazard associated with this gas mixture is the potential for anesthetic and peripheral neuropathy effects after inhalation over-exposures to the Propane, n-Pentane and n-Hexane components of this gas mixture. Specific human over-exposure data are available for n-Pentane and n-Hexane, as follows:

CONCENTRATION OF n-PENTANE	OBSERVED EFFECT
Brief (10 minute) up to 5,000 ppm:	No symptoms.
Higher than 5,000 ppm:	Exhilaration, dizziness and headache can occur.
Long term:	Can cause chronic neurological disorder causing damage to the nerves in the hands and feet (peripheral neuropathy)

CONCENTRATION OF n-HEXANE	OBSERVED EFFECT
Brief (10 minute) at 1,500 ppm:	Irritation of the respiratory tract, nausea and headache.
5000 ppm:	Dizziness and drowsiness can occur.
Long term at 500 ppm:	Can affect the nerves in the arms and legs. Effects include numbing or tingling sensations in the fingers and toes, tiredness, muscle weakness, cramps and spasms in the leg, difficulty in holding objects or walking, abdominal pains, loss of appetite, weight loss. More serious exposures can cause damage to the nerves in the hands and feet (peripheral neuropathy).
Eyes and Vision:	Abnormal color perception and pigment changes in the eyes have been reported among industrial workers exposed to 423-1280 ppm for 5 years or more.
Blood Cells:	Mild forms of anemia have also been associated with exposure to hexane. These are of temporary nature.

Additionally, if mixtures of this gas mixture contain less than 19.5% Oxygen and are released in a small, poorly ventilated area (i.e. an enclosed or confined space), an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The following effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

SKIN and EYE CONTACT: The Hydrogen Sulfide component of this gas mixture may be irritating to the skin. Inflammation and irritation of the eyes can occur at very low airborne concentration of Hydrogen Sulfide (less than 10 ppm). Exposure over several hours may result in “gas eyes” or “sore eyes” with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm of Hydrogen Sulfide, there is an intense tearing, blurring of vision, and pain when looking at light. Over-exposed individuals may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases, the eye can be permanently damaged.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. However, the Hydrogen Sulfide and Carbon Monoxide components of this gas mixture are toxic to humans. Over-exposure to this gas mixture can cause nausea, dizziness, headaches, collapse, unconsciousness, coma, and death. Due to the presence of Hydrogen Sulfide, over-exposures to this gas mixture can also irritate the skin and eyes; severe eye contamination can result in blindness.

Inhalation over-exposures to Propane, n-Pentane, and n-Hexane can cause anesthetic effects and motor neuropathy (i.e. pain and tingling in feet and hands).

3. HAZARD IDENTIFICATION (Continued)

CHRONIC: Abnormal color perception and pigment changes in the eyes have been reported among persons exposed to 420 -1300 ppm of n-Hexane for five years. Additionally, long-term exposure to low levels of n-Hexane or n-Pentane can affect the nerves in the arms and legs. Effects include numbing or tingling sensation, tiredness, cramps, spasms in legs, difficulty holding objects or walking, loss of appetite and weight loss. Pentane isomers, such as n-Pentane, and Propane can cause sensitization of the heart to epinephrine. Refer to Section 11 (Toxicology Information) for additional information on the components of this gas mixture.

TARGET ORGANS: ACUTE: Respiratory system, blood system, central nervous system, cardiovascular system. CHRONIC: Reproductive system, cardiovascular system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary.

Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

SKIN EXPOSURE: If irritation of the skin develops after exposure to this gas mixture, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

EYE EXPOSURE: If irritation of the eye develops after exposure to this gas mixture, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Seek medical assistance immediately, preferably an ophthalmologist.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions may be aggravated by over-exposure to this gas mixture. Carbon Monoxide, a component of this gas mixture, can aggravate some diseases of the cardiovascular system, such as coronary artery disease and angina pectoris. Because of the presence of Hydrogen Sulfide, n-Hexane or n-Pentane in this gas mixture, central nervous system conditions, eye disorders, or skin problems may be aggravated by over-exposure to this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure. Hyperbaric oxygen is the most efficient antidote to Carbon Monoxide poisoning, the optimum range being 2-2.5 atm. A special mask, or, preferably, a compression chamber to utilize oxygen at these pressures is required. Avoid administering stimulant drugs. Be observant for initial signs of pulmonary edema in the event of severe inhalation over-exposures.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

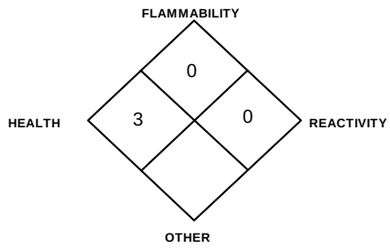
UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture contains toxic gases, Hydrogen Sulfide and Carbon Monoxide, and presents an extreme health hazard to firefighters. This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

NFPA RATING



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of over-exposure to Hydrogen Sulfide and Carbon Monoxide, the toxic components of this gas mixture, and other safety hazards related to the remaining components of this gas mixture, than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for Hydrogen Sulfide, Carbon Monoxide, and Oxygen. Hydrogen Sulfide and Carbon Monoxide level must be below exposure level listed in Section 2 (Composition and Information on Ingredients) and Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to olfactory fatigue or oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify cylinders containing a gas mixture with Hydrogen Sulfide or Carbon Monoxide. If there is a malfunction or another type of operational problem, contact nearest distributor immediately. Eye wash stations/safety showers should be near areas where this gas mixture is used or stored. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. All work practices should minimize releases of Hydrogen Sulfide and Carbon Monoxide-containing gas mixtures.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C, 70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage.

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Oxygen, Hydrogen Sulfide, and Carbon Monoxide.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if Carbon Monoxide levels exceed the exposure levels given in Section 2 (Composition and Information on Ingredients) or if oxygen levels are below 19.5%, or if either level is unknown during emergency response to a release of this gas mixture. If respiratory protection is required for emergency response to this gas mixture, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards. The following NIOSH respiratory protection recommendations for Hydrogen Sulfide and Carbon Monoxide are provided for further information.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

NIOSH/OSHA RECOMMENDATIONS FOR HYDROGEN SULFIDE CONCENTRATIONS IN AIR:

Up to 100 ppm: Powered air-purifying respirator with cartridge(s) to protect against hydrogen sulfide; or gas mask with canister to protect against hydrogen sulfide; or SAR; or full-facepiece SCBA.

Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

Escape: Gas mask with canister to protect against hydrogen sulfide; or escape-type SCBA

NOTE: The IDLH concentration for Hydrogen Sulfide is 100 ppm.

NIOSH/OSHA RECOMMENDATIONS FOR CARBON MONOXIDE CONCENTRATIONS IN AIR:

Up to 350 ppm Supplied Air Respirator (SAR)

Up to 875 ppm Supplied Air Respirator (SAR) operated in a continuous flow mode.

Up to 1200 ppm Gas mask with canister to protect against carbon monoxide; or full-facepiece SCBA; or full-facepiece Supplied Air Respirator (SAR).

Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece Supplied Air Respirator (SAR) with an auxiliary positive pressure SCBA.

Escape: Gas mask with canister to protect against carbon monoxide; or escape-type SCBA.

NOTE: End of Service Life Indicator (ESLI) required for gas masks.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: No special protection is needed under normal circumstances of use. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/ ft^3 (1.153 kg/m^3)

FREEZING/MELTING POINT @ 10 psig: -210°C (-345.8°F)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906

SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: Not applicable.

VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

BOILING POINT: -195.8°C (-320.4°F)

pH: Not applicable.

MOLECULAR WEIGHT: 28.01

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft^3/lb): 13.8

The following information is for the gas mixture.

APPEARANCE AND COLOR: This gas mixture is a colorless gas which has an rotten egg-like odor, due to the presence of Hydrogen Sulfide.

HOW TO DETECT THIS SUBSTANCE (warning properties): Continuous inhalation of low concentrations of Hydrogen Sulfide (a component of this gas mixture) may cause olfactory fatigue, so that there are no distinct warning properties. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation. Wet lead acetate paper can be used for leak detection. The paper turns black in the presence of Hydrogen Sulfide. Cadmium chloride solutions can also be used. Cadmium solutions will turn yellow upon contact with Hydrogen Sulfide.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Propane, n-Hexane, and n-Pentane include carbon oxides. The decomposition products of Hydrogen Sulfide include water and sulfur oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. Components of this gas mixture (Hydrogen Sulfide, Propane, n-Pentane, n-Hexane) are also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). Carbon Monoxide is mildly corrosive to nickel and iron (especially at high temperatures and pressures). Hydrogen Sulfide is corrosive to most metals, because it reacts with these substances to form metal sulfides.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this gas mixture:

NITROGEN: There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the

n-PENTANE:

LD_{50} (intravenous, mouse) = 446 mg/kg.

LC_{50} (inhalation, rat) = 364 g/m^3/4 hours

LCLo (inhalation, mouse) = 325 g/m^3/2 hours

n-HEXANE:

Eye, rabbit = 10 mg/ mild

TCLo (inhalation, rat) = 10,000 ppm/7 hr.

TCLo (inhalation, rat) = 5000 ppm/20 hours; teratogenic effects

LD50 (oral, rat) = 28710 mg/kg

LDLo (intraperitoneal, rat) = 9100 mg/kg

LCLo (inhalation, mouse) = 120,000 mg/kg

LD50 (rat, oral): 28,710 mg/kg

ACUTE INHALATION (mouse): 30,000 ppm, narcosis within 30 to 60 minutes; 35,000-40,000 ppm, convulsions and death.

DERMAL (rabbit): 2 to 5 ml/kg for 4 hours resulted in restlessness and discoordination,; death occurred at 5 ml/kg.

HYDROGEN SULFIDE:

LCLo (inhalation, human) = 600 ppm/30 minutes

LDLO (inhalation, man) = 5.7 mg/kg; central nervous system, pulmonary effects

n-HEXANE (continued):

CHRONIC INHALATION (rat): 400-600 ppm, 5 days/week, peripheral neuropathy in 45 days; 850 ppm for 143 days, loss of weight and degeneration of the sciatic nerve. (mouse): 250 ppm, peripheral neuropathy within 7 months; no effects at 100 ppm.

PROPANE:

Long-Term Inhalation: No toxicity or abnormalities were observed when monkeys were exposed to approximately 750 ppm for 90 days. Similar results were obtained when monkeys were exposed to an aerosol spray containing 65% propane and isobutane.

CARBON MONOXIDE:

TCLo (inhalation, mouse) = 65 ppm/24 hours (7-18 preg): rep. effects

TCLo (inhalation, mouse) = 8 pph/1 hour (female 8D post): ter. effects

HYDROGEN SULFIDE (continued):

LCLo (inhalation, human) = 800 ppm/5 minutes

LC_{50} (inhalation, rat) = 444 ppm

CARBON MONOXIDE (continued):

TCLo (inhalation, human) = 600 mg/m^3/10 minutes

LCLo (inhalation, man) = 4000 ppm/30 minutes

TCLo (inhalation, man) = 650 ppm/45 minutes: central nervous system and blood system effects.

LCLo (inhalation, human) = 5000 ppm/5 minutes

LCLo (inhalation, dog) = 4000 ppm/46 minutes

LCLo (inhalation, rabbit) = 4000 ppm

LC_{50} (inhalation, rat) = 1811 ppm/4 hours

LC_{50} (inhalation, guinea pig) = 2450 ppm/4 hours

LC_{50} (inhalation, guinea pig) = 5718 ppm/4 hours

LCLo (inhalation, mammal) = 5000 ppm/5 minutes

LD_{50} (inhalation, wild bird) = 1334 ppm

HYDROGEN SULFIDE (continued):

LC_{50} (inhalation, mouse) = 673 ppm/1 hour

LCLo (inhalation, mammal) = 800 ppm/5 minutes

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: The Hydrogen Sulfide component of this gas mixture, is irritating to the eyes, and may be irritating to the skin.

SENSITIZATION OF PRODUCT: The components of this gas mixture are not known to be skin or respiratory sensitizers. Pentane isomers (i.e. n-Pentane) and Propane can cause cardiac sensitization to epinephrine.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for the components of this gas mixture.

Embryotoxicity: This gas mixture contains components that may cause embryotoxic effects in humans; however, due to the small total amount of the components, embryotoxic effects are not expected to occur.

Teratogenicity: This gas mixture is not expected to cause teratogenic effects in humans due to the small cylinder size and small total amount of all components. The Carbon Monoxide component of this gas mixture which exists up to 1%, can cause teratogenic effects in humans. Severe

11. TOXICOLOGICAL INFORMATION (continued)

exposure to Carbon Monoxide during pregnancy has caused adverse effects and the death of the fetus. In general, maternal symptoms are an indicator of the potential risk to the fetus since Carbon Monoxide is toxic to the mother before it is toxic to the fetus.

Reproductive Toxicity: The components of this gas mixture are not expected to cause adverse reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): Biological Exposure Indices (BEIs) have been determined for the components of this gas mixture, as follows:

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
CARBON MONOXIDE • Carboxyhemoglobin in blood • Carbon monoxide in end-exhaled air	 • End of shift • End of shift	 • 3.5% of hemoglobin • 20 ppm
n-HEXANE • 2,5-Hexanedione in urine • n-Hexane in end-exhaled air	• End of shift	• 5 mg/g creatinine

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65

PROPANE: Log K_{ow} = 2.38. Water Solubility = 62.4 ppm, 25°C. Propane is readily degraded by soil bacteria.

PENTANE: Log K_{ow} = 3.39. Water Solubility = 38.5 mg/L. LOG BCF (n-pentane) = calculated, 1.90 and 2.35, respectively. Photolysis, hydrolysis, and bioconcentration are not anticipated to be important fate processes. Biodegradation and soil adsorption are anticipated to be more important processes for this compound.

n-HEXANE: Log K_{ow} = 3.90-4.11. Water Solubility = 9.5 mg/L. Estimated Bioconcentration Factor =2.24 and 2.89. Bioconcentration in aquatic organisms is low. Hexane is volatile. Rapid volatilization from water and soil is anticipated for this compound. Hexane will float in slick on surface of the water

HYDROGEN SULFIDE: Water Solubility = 1 g/242 mL at 20°C.

CARBON MONOXIDE: Water solubility = 3.3 ml/100 cc at 0 °C, 2.3 ml at 20°C.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C; 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this gas mixture's effects on plant and animal life. The Hydrogen Sulfide and Carbon Monoxide components of this gas mixture, can be deadly to exposed animal life, producing symptoms similar to those experienced by humans. This gas mixture may also be harmful to plant life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of this gas effects on aquatic life. The presence of more than a trace of Carbon Monoxide is a hazard to fish. The following aquatic toxicity data are available for the Hydrogen Sulfide component of this gas mixture.

TLm (Asellussp) = 0.111 mg/L/96 hour
TLm (Cranfgonyx sp) =1.07 mg/L/96 hour
TLm (Gammarrus) = 0.84 mg/L/96 hour
LC_{50} (fly inhalation) = 380 mg/m^3/960 minutes
LC_{50} (fly inhalation) = 1500 mg/m^3/7 minutes
TLm (Lepomis macrochirus, bluegill sunfish) = 0.0478 mg/L/96 hour
TLm (Lepomis macrochirus, bluegill sunfish) = 0.0448 mg/L/96 hour at 21-22 °C
TLm (Pimephlaes promelas, fathead minnow) = 0.0071-0.55 mg/L/96 hour
TLm (Salvenilis foninalis, brook trout) = 0.0216-0.038 mg/L/96 hour at 8-12.5 °C

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not Applicable

HAZARD LABEL: Class 2.2 (Non-Flammable Gas)

SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12

ERAP INDEX: None

PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: This gas is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows:

COMPONENT	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
n-Hexane	NO	YES	YES
Hydrogen Sulfide	YES	YES	YES

15. REGULATORY INFORMATION (Continued)

U.S. SARA THRESHOLD PLANNING QUANTITY: Section 302 EHS TPQ = Hydrogen Sulfide = 500 lbs (227 kg);
U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.
U.S. CERCLA REPORTABLE QUANTITY (RQ): Hexane = 5000 lb (2270 kg); Hydrogen Sulfide = 100 lbs (45.4 lb)
OTHER U.S. FEDERAL REGULATIONS:

- Hydrogen Sulfide, Carbon Monoxide, Propane, n-Pentane and n-Hexane are subject to the reporting requirements of CFR 29 1910.1000.
- Hydrogen Sulfide, Propane and n-Pentane are subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for each of these gases is 10,000 pounds and so this mixture will not be affected by the regulation.
- Depending on specific operations involving the use of this gas mixture, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Hydrogen Sulfide is listed in Appendix A of this regulation. The Threshold Quantity for Hydrogen Sulfide under this regulation is 1500 lbs.
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Nitrogen, Oxygen and n-Hexane are not listed Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Hydrogen Sulfide is listed under this regulation in Table 1 as a Regulated Substance (Toxic Substance), in quantities of 10,000 lbs (4,553 kg) or greater. Carbon Monoxide, Propane and n-Pentane are listed under this regulation in Table 3, as Regulated Substances (Flammable), in quantities of 10,000 lbs (4,553 kg) or greater, and so this mixture will not be affected by the regulation.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Carbon Monoxide, Propane, n-Pentane, n-Hexane, Hydrogen Sulfide.
California - Permissible Exposure Limits for Chemical Contaminants: Carbon Monoxide, Nitrogen, Propane, n-Pentane, n-Hexane, Hydrogen Sulfide.
Florida - Substance List: Oxygen, Carbon Monoxide, n-Pentane, n-Hexane, Hydrogen Sulfide.
Illinois - Toxic Substance List: Carbon Monoxide, Propane, n-Pentane, n-Hexane, Hydrogen Sulfide.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Oxygen, Carbon Monoxide, Propane, n-Pentane, n-Hexane, Hydrogen Sulfide.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: Carbon Monoxide, Propane, n-Pentane, n-Hexane, Hydrogen Sulfide.
Missouri - Employer Information/Toxic Substance List t: n-Pentane, n-Hexane, Propane, Hydrogen Sulfide.
New Jersey - Right to Know Hazardous Substance List: Oxygen, Carbon Monoxide, Nitrogen, Propane, n-Pentane, n-Hexane.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: Hydrogen Sulfide.
Pennsylvania - Hazardous Substance List: Oxygen, Carbon Monoxide, Nitrogen, Propane, n-Pentane, n-Hexane, Hydrogen Sulfide.
Rhode Island - Hazardous Substance List: Oxygen, Carbon Monoxide, Nitrogen, Propane, n-Pentane, n-Hexane, Hydrogen Sulfide.
Texas - Hazardous Substance List: n-Pentane, n-Hexane, Propane, Hydrogen Sulfide.
West Virginia - Hazardous Substance List: n-Pentane, n-Hexane, Propane, Hydrogen Sulfide.
Wisconsin - Toxic and Hazardous Substances: n-Pentane, n-Hexane, Propane, Hydrogen Sulfide

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The Carbon Monoxide component of this gas mixture is on the California Proposition 65 lists as a chemical known to the State of California to cause birth defects or other reproductive harm.
ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this gas mixture are on the Canadian DSL Inventory.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances List.
CANADIAN WHMIS CLASSIFICATION: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGAZ will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
"Handbook of Compressed Gases"

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 3519, La Mesa, CA 91944-3519
619/670-0609

Fax on Demand: 1-800/231-1366

AIR LIQUIDE™

SAFETY DATA SHEET

Version 4.20
Revision Date 11/07/2017
Print Date 10/06/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Trizma® base

Product Number : T1503
Brand : Sigma

CAS-No. : 77-86-1

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

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

This substance is not considered to be persistent, bioaccumulating and toxic (PBT).

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 2-Amino-2-(hydroxymethyl)-1,3-propanediol
THAM
Trometamol
Tris base
Tris(hydroxymethyl)aminomethane

Formula : $C_4H_{11}NO_3$
Molecular weight : 121.14 g/mol
CAS-No. : 77-86-1
EC-No. : 201-064-4
Registration number : 01-2119957659-16-XXXX

No components need to be disclosed according to the applicable regulations.

4. FIRST AID MEASURES

4.1 Description of first aid measures

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

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
Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions
No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up
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
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.

Hygroscopic. Store under inert gas.
Storage class (TRGS 510): 13: Non Combustible Solids

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
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

Eye/face protection
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
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
No special environmental precautions required.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: colourlesswhite
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	10.5 - 12

e)	Melting point/freezing point	Melting point/range: 168 °C (334 °F)
f)	Initial boiling point and boiling range	288 °C (550 °F) at 1,013 hPa (760 mmHg) - Decomposes below the boiling point.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	Does not sustain combustion.
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	678 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: -2.31 at 20 °C (68 °F)
p)	Auto-ignition temperature	The substance or mixture is not classified as self heating.
q)	Decomposition temperature	No data available
r)	Viscosity	Not applicable
s)	Explosive properties	Not explosive
t)	Oxidizing properties	The substance or mixture is not classified as oxidizing.

9.2 Other safety information

Bulk density	800 kg/m3
Dissociation constant	8.22 at 25 °C (77 °F)

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
hygroscopic

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx)
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
LD50 Oral - Rat - > 5,000 mg/kg
(OECD Test Guideline 425)

Inhalation: No data available

LD50 Dermal - Rat - > 5,000 mg/kg
(OECD Test Guideline 402)

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
Buehler Test - Guinea pig
Does not cause skin sensitisation.
(OECD Test Guideline 406)

Germ cell mutagenicity
Result: Not mutagenic in Ames Test

in vitro assay
Result: negative
In vitro tests did not show mutagenic effects

Result: In vivo tests did not show any chromosomal changes.

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

Repeated dose toxicity	Rat - Oral - Subacute toxicity - NOAEL : 1,000 mg/kg

RTECS: TY2900000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic	EC50 - Daphnia (water flea) - > 980 mg/l - 48 h

invertebrates

Toxicity to algae	EC50 - Algae - 397 mg/l - 72 h
	NOEC - Algae - 100 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability	Result: - Readily biodegradable. (OECD Test Guideline 301F)

12.3 Bioaccumulative potential

No bioaccumulation is to be expected (log Pow <= 4).

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

This substance is not considered to be persistent, bioaccumulating and toxic (PBT).

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

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

No SARA Hazards

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Tris (hydroxymethyl) aminomethane	77-86-1	

	CAS-No.	Revision Date
Tris (hydroxymethyl) aminomethane	77-86-1	

New Jersey Right To Know Components

	CAS-No.	Revision Date

Tris (hydroxymethyl) aminomethane 77-86-1

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

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
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: 4.20 Revision Date: 11/07/2017 Print Date: 10/06/2018

APPENDIX C

Personal Protective Equipment (PPE) Management Program

PERSONAL PROTECTIVE EQUIPMENT MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	**:**	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	**:**	**01/19**
REVISION NUMBER	**:**	**4**

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1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") has instituted the following program to establish guidelines for the selection of personal protective equipment (PPE) for use by Roux personnel performing field activities in hazardous environments. PPE is not meant to be a substitute for engineering, work practice, and/or administrative controls, but PPE should be used in conjunction with these controls to protect the employees in the work place. Clothing, body coverings, and other accessories designed to prevent worker exposure to workplace hazards are all types of PPE. To ensure adequate PPE employee-owned PPE is evaluated on a case-by-case basis to insure its adequacy, maintenance and sanitation.

2. SCOPE AND APPLICABILITY

These guidelines apply to all PPE selection decisions to be made in implementing the Roux program. The foundations for this program are the numerous Occupational Health and Safety Administration (OSHA) standards related to PPE cited in 29 CFR 1910 Subpart I, 29 CFR 1926 Subpart E, and the hazardous environment work employee protection requirements under the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 and 1926.65. To ensure hazard assessments are documented the levels of protection, types of protection and tasks requiring protection are covered in site-specific Health and Safety Plans (HASPs) and Job Safety Analyses (JSAs).

3. PROCEDURES

Due to the varied nature of site activities and the different potential hazards associated with different sites, several aspects must be considered when selecting PPE. The following text describes PPE selection logic and provides guidelines and requirements for the appropriate selection and use of PPE.

3.1 Introduction

To harm the body, chemicals must first gain entrance. The intact skin and the respiratory tract are usually the first body tissues attacked by chemical contaminants. These tissues provide barriers to some chemicals but in many cases, are damaged themselves or are highly permeable by certain chemical compounds. Personal protective equipment therefore is used to minimize or eliminate chemical compounds coming into contact with these first barrier tissues.

The proper selection of equipment is important in preventing exposures. The PM making the selection will have to take several factors into consideration. The level of protection, type and kind of equipment selected depends on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors must be made before work can be safely carried out.

3.2 Types of PPE

The type and selection of PPE must meet certain general criteria and requirements as required under OSHA 29 CFR 1910.132 and 1926.95. In addition to these general requirements, specific requirements and specifications exist for some types of PPE that form the basis of the protective clothing scheme. Following is a list of the common types of specific PPE and the specific requirements for the PPE type, where applicable:

1. Hard Hats - Regulated by 29 CFR 1910.135 and 1926.100; and, specified in ANSI Z89.1.

2. Face Shields and Safety Glasses - Regulated by 29 CFR 1910.133 and 1926.102; and, specified in ANSI Z87.1.
3. Respiratory Protection - Regulated by 29 CFR 1910.134 and 1926.103.
4. Hand Protection - Not specifically regulated.
5. Foot Protection - Regulated by 29 CFR 1910.136 and 1926.96; and, specified in ANSI Z41.1.
6. Protective Clothing (e.g., fully encapsulated suits, aprons) - Not specifically regulated.

3.3 Protective Clothing Selection Criteria

3.3.1 Chemicals Present

The most important factor in selecting PPE is the determination of what chemicals the employee may be exposed to. On field investigations, the number of chemicals may range from a few to several hundred. The exact chemicals or group of chemicals present at the site (certain groups tend to require similar protection) can be determined by collecting and analyzing samples of the air, soil, water, or other site media. When data are lacking, research into the materials used or stored at the site can be used to infer chemicals possibly on the site.

Once the known or suspected chemicals have been identified, and taking into consideration the type of work to be performed, the most appropriate clothing shall be selected.

Protective garments are made of several different substances for protection against specific chemicals. There is no universal protective material. All will decompose, be permeated by, or otherwise fail to protect under given circumstances. Fortunately, most manufacturers make guides to the use of their products (i.e., Dupont's Tyvek™ Permeation Guide). These guides are usually for gloves and coveralls and typically provide information regarding chemical degradation rates (failure of the material to maintain structural integrity when in contact with the chemical), and may provide information on the permeation rate (whether or not the material allows the chemical to pass through). When permeation tables are available, they shall be used in conjunction with degradation tables to determine the most appropriate protective material.

During most site work, chemicals are usually in mixed combinations and the protective materials are not in continuous contact with pure chemicals for long periods of time; therefore, the selected material may be adequate for the particular chemical and type of work being performed, yet not the "best" protecting material for all site chemicals and activities. Selection shall depend upon the most hazardous chemicals based on their hazards and concentrations. Sometimes layering, using several different layers of protective materials, affords the best protection.

3.3.2 Concentration of the Chemical(s)

One of the major criteria for selecting protective material is the concentration of the chemical(s) in air, liquid, and/or solid state. Airborne and liquid chemical concentrations should be compared to the OSHA standards and/or American Conference of Governmental Industrial Hygienists (ACGIH) and National Institute for Occupational Safety and Health (NIOSH) guidelines to determine the level of skin or other absorptive surface (e.g., eyes) protection needed. While these standards are not designed specifically for skin exposed directly to the liquid, they may provide skin designations indicative of chemicals known to have significant skin or dermal absorption effects. For example, airborne levels of PCB on-site may be

low because it is not very volatile, so the inhalation hazard may be minimal; however, PCB-containing liquid coming in direct contact with the skin may cause overexposure. Thus, PCB has been assigned a skin designation in both the OSHA and ACGIH exposure limit tables.

3.3.3 Physical State

The characteristics of a chemical may range from nontoxic to extremely toxic depending on its physical state. Inorganic lead in soil would not be considered toxic to site personnel, unless it became airborne, since it is generally not absorbed through the intact skin. Organic lead in a liquid could be readily absorbed. Soil is frequently contaminated with hazardous materials. Concentrations will vary from a few parts per million to nearly one hundred percent. The degree of hazard is dependent on the type of soil and concentration of the chemical. Generally speaking, "dry" soils do not cause a hazard to site personnel if they take minimal precautions such as wearing some type of lightweight gloves.

3.3.4 Length of Exposure

The length of time a material is exposed to a chemical increases the probability of breakthrough. Determinations of actual breakthrough times for short-term exposures indicate that several different materials can be used which would be considered inadequate under long-term exposures. It should be kept in mind that during testing, a pure (100% composition) liquid is usually placed in direct contact with the material producing a worst-case situation.

3.3.5 Abrasion

When selecting protective clothing, the job the employee is engaged in must be taken into consideration. Persons moving drums or performing other manual tasks may require added protection for their hands, lower chest and thighs. The use of leather gloves and a heavy apron over the other normal protective clothing will help prevent damage to the normal PPE and thus reduce worker exposures.

3.3.6 Dexterity

Although protection from skin and inhalation hazards is the primary concern when selecting PPE, the ability to perform the assigned task must be maintained. For example, personnel cannot be expected to perform work that requires fine dexterity if they must wear a thick glove. Therefore, the PPE selection process must consider the task being performed and provide PPE alternatives or techniques that allow dexterity to be maintained while still protecting the worker (e.g., wearing tight latex gloves over more bulky hand protection to increase dexterity).

3.3.7 Ability to Decontaminate

If disposable clothing cannot be used, the ability to decontaminate the materials selected must be taken into consideration. Once a chemical contacts the material, it must be cleaned before it can be reused. If the chemical has completely permeated the material, it is unlikely that the clothing can be adequately decontaminated and the material should be discarded.

3.3.8 Climactic Conditions

The human body works best with few restraints from clothing. Protective clothing adds a burden by adding weight and restricting movement as well as preventing the natural cooling process. In severe situations, a modified work program must be used.

Some materials act differently when they are very hot and very cold. For example, PVC becomes almost brittle in very cold temperatures. If there are any questions about the stability of the protective materials under different conditions, the manufacturer should be contacted.

3.3.9 Work Load

Like climactic conditions, the type of work activity may affect work duration and the ability or personnel to perform certain tasks. Similarly, the amount of protective materials a person wears will affect their ability to perform certain tasks. For example, a person in a total encapsulating suit, even at 72 ^{o}F, cannot work for more than a short period of time without requiring a break.

The work schedule should be adjusted to maintain the health of the employees. Special consideration should be given to the selection of clothing that both protects and adds the least burden when personnel are required to perform strenuous tasks. Excessive bodily stress frequently represents the most significant hazard encountered during field work.

3.4 Types of Protective Materials

1. Cellulose or Paper
2. Natural and Synthetic Fibers
    a. Tyvek™
    b. Nomex™
3. Elastomers
    a. Polyethylene
    b. Saran
    c. Polyvinyl Chloride (PVC)
    d. Neoprene
    e. Butyl Rubber
    f. Viton

3.5 Protection Levels

3.5.1 Level A Protection

Level A protection (a fully encapsulated suit) is used when skin hazards exist or when there is no known data that positively rule out skin and other absorption hazards. Since Level A protection is extremely physiologically and psychologically stressful, the decision to use this protection must be carefully considered. At no time will Level A work be performed without the consent of the OM. The following conditions suggest a need for Level A protection:

- confined facilities where probability of skin contact is high;
- sites containing known skin hazards;
- sites with no established history to rule out skin and other absorption hazards;
- atmosphere immediately dangerous to life and health (IDLH) through the skin absorption route;
- site exhibiting signs of acute mammalian toxicity (e.g., dead animals, illnesses associated with past entry into site by humans);

- sites at which sealed drums of unknown materials must be opened;
- total atmospheric readings on the Photoionization Detector (PID), Flame Ionization Detector (FID), and similar instruments indicate 500 to 1,000 ppm of unidentified substances; and
- extremely hazardous substances (e.g., cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens and infectious substances) are known or suspected to be present and skin contact is possible.

The following items constitute Level A protection:

- open circuit, pressure-demand self-contained breathing apparatus (SCBA);
- totally encapsulated suit;
- gloves, inner (surgical type);
- gloves, outer;
- chemical protective;
- boots, chemical protective, steel toe and shank;
- radiation detector (if applicable); and
- communications.

3.5.2 Level B Protection

Level B protection is utilized when the highest level of respiratory protection is needed but hazardous material exposure to the few unprotected areas of the body is unlikely.

The following conditions suggest a need for Level B protection:

- the type and atmospheric concentration of toxic substances have been identified and they require the highest level of respiratory protection;
- IDLH atmospheres where the substance or concentration in the air does not present a severe skin hazard;
- the type and concentrations of toxic substances do not meet the selection criteria permitting the use of air purifying respirators; and
- it is highly unlikely that the work being done will generate high concentrations of vapors, gases or particulates, or splashes of materials that will affect the skin of personnel.

Personal protective equipment for Level B includes:

- open circuit, pressure-demand SCBA;
- chemical protective clothing:
- overalls and long-sleeve jacket; or
- coveralls;
- gloves, inner (surgical type); gloves, outer, chemical protective;
- boots, chemical protective, steel toe and shank; and
- communications optional.

3.5.3 Level C Protection

Level C protection is utilized when both skin and respiratory hazards are well defined and the criteria for the use of negative pressure respirators have been fulfilled (i.e., known contaminants and contaminant concentrations, acceptable oxygen levels, approved filter/cartridge available, known cartridge service life, etc.). Level C protection may require carrying an emergency escape respirator during certain initial entry and site reconnaissance situations, or when applicable thereafter.

Personal protective equipment for Level C typically includes:

- full facepiece air-purifying respirator;
- emergency escape respirator (optional);
- chemical protective clothing:
  - overalls and long-sleeved jacket; or
  - coveralls;
- gloves, inner (surgical type);
- gloves, outer, chemical protective; and
- boots, chemical protective, steel toe and shank.

3.5.4 Level D Protection

Level D is the basic work uniform. Personal protective equipment for Level D includes:

- coveralls;
- safety boots/shoes;
- eye protection;
- hand protection;
- reflective traffic safety vest (mandatory for traffic areas or railyard);
- hard hat (with face shield is optional); and
- emergency escape respirator is optional.

3.5.5 Level E Protection

Level E protection is used when radioactivity above 10 mr/hr is detected at the site. Personal protective equipment for Level E includes:

- coveralls;
- air purifying respirator;
- time limits on exposure;
- appropriate dermal protection for the type of radiation present; and
- radiation dosage monitoring.

3.5.6 Additional Considerations

Field work will contain a variety of situations due to chemicals in various concentrations and combinations. These situations may be partially ameliorated by following the work practices listed below:

1. Some sort of foot protection is needed on a site. If the ground to be worked on is contaminated with liquid and it is necessary to walk in the chemicals, some sort of protective "booties" can be worn over the boots. This cuts down on decontamination requirements. They are designed with soles to help prevent them from slipping around. If non-liquids are to be encountered, a Tyvek™ bootie could be used. If the ground contains any sharp objects, the advantage of booties is questionable. Boots should be worn with either cotton or wool socks to help absorb the perspiration.

2. If the site situation requires the use of hard hats, chin straps should be used if a person will be stooping over where his/her hat may fall off. Respirator straps should not be placed over the hard hats. This will affect the fit of the respirator.

   Some types of protective materials conduct heat and cold readily. In cold conditions, natural material clothing should be worn under the protective clothing. Protective clothing should be removed prior to allowing a person "to get warm". Applying heat, such as a space heater, to the outside of the protective clothing may drive the contaminants through. In hot weather, under clothing will absorb sweat. It is recommended that workers use all cotton undergarments.

3. Body protection should be worn and taped to prevent anything from running into the top of the boot. Gloves should be worn and taped to prevent substances from entering the top of the glove. Duct tape is preferred, but masking tape can be used. When aprons are used, they should be taped across the back for added protection. However, this should be done in such a way that the person has mobility.

4. Atmospheric conditions such as precipitation, temperature, wind direction, wind velocity, and pressure determine the behavior of contaminants in air or the potential for volatile material getting into the air. These parameters should be considered in determining the need for and the level of protection.

5. A program must be established for periodic monitoring of the air during site operations. Without an air monitoring program, any changes would go undetected and might jeopardize response personnel. Monitoring can be done with various types of air pumps and filtering devices followed by analysis of the filtration media; personnel dosimeters; and periodic walk-throughs by personnel carrying real-time survey instruments.

6. For operations in the exclusion zone, different levels of protection may be selected, and various types of chemical-resistant clothing may be worn. This selection should be based on the job function, reason for being in the area, and the potential for skin contact with, or inhalation of, the chemicals present.

7. Escape masks must be readily available when levels of respiratory protection do not include a SCBA and the possibility of an IDLH atmosphere exists. Their use can be made on a case-by-case basis. Escape masks could be strategically located at the site in areas that have higher possibilities of vapors, gases or particulates.

APPENDIX D

Generic Community Air Monitoring Plan (CAMP)

APPENDIX D

New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

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

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

APPENDIX E

Safety Meeting Log

HEALTH AND SAFETY BRIEFING / TAILGATE MEETING FORM

Site Name / Location _____

Date: _____ Weather Forecast: _____

Names of Personnel Attending Briefing

_____ _____ _____

_____ _____ _____

_____ _____ _____

Planned Work

_____

_____

_____

Instrument Calibration: Instrument/Time/Cal. Gas/Cal. Concentration/Actual Concentration

_____

_____

_____

Items Discussed

_____

_____

_____

_____

_____

Work Permit Type and Applicable Restrictions

_____

_____

_____

Signatures of Attending Personnel

_____ _____ _____

_____ _____ _____

_____ _____ _____

APPENDIX F

Subsurface Utility Clearance Management Program

SUBSURFACE UTILITY CLEARANCE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	**:**	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	**:**	**07/18**
REVISION NUMBER	**:**	**1**

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APPENDICES

Appendix A – Definitions
Appendix B – Example of Completed One Call
Appendix C – Roux Subsurface Utility Clearance Checklist
Appendix D – Utility Verification/Site Walkthrough Record

1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") has instituted the following program for completing proper utility mark-outs and for conducting subsurface clearance activities. This establishes a method to ensure, to the greatest extent possible, that utilities have been identified and contact and/or damage to underground utilities and other subsurface structures will be avoided.

2. SCOPE AND APPLICABILITY

The Subsurface Utility Clearance Management Program applies to all Roux employees, its contractors and subcontractors. Employees are expected to follow this program for all intrusive work involving Roux or other personnel (e.g., contractors/subcontractors) working for Roux unless the client's requirements are more stringent. Deviation from the program regardless of the specific work activity or work location must be pre-approved based on client's site knowledge, site experience and client's willingness for the use of this program. Any and all exceptions shall be documented and pre-approved by the Project Principal and the Office Manager.

3. PROCEDURES

3.1 Before Intrusive Activities

During the project kick-off meeting for intrusive activities the PM will review the Roux Subsurface Utility Clearance Checklist and Utility Verification (Appendix C) / Site Walkthrough Record (Appendix D) and the below bullet points with the project field team:

(Please note that these are intended as general reminders only and should not be solely relied upon.)

- Ensure the Mark-out / Stake-out Request Information Sheet (or one-call report) is complete and accurate for the site including address and cross streets and review for missing utilities. (Note: utility mark-out organizations do not have contracts with all utilities and it is often necessary to contact certain utilities separately such as the local water and sewer authorities).
- Have written confirmation prior to mobilizing to the site that the firm or Roux personnel performing the intrusive activity has correctly completed the mark-out notification process including requesting mark-outs, waiting for mark-outs to be applied to ground surfaces at the site, and receiving written confirmation of findings (via fax or email) from utility operators for all known or suspected utilities in the proposed area of intrusive activity, and provided utility owner written confirmation to Roux personnel for review and project files documentation.
- Do not begin any intrusive activity until all utilities mark-out has been completed (i.e., did all utilities mark-out the site?) and any unresolved mark-out issues are finalized. Perform a site walk to review the existing utilities and determine if said utilities have been located by the utility locators.

  (Note: The Tolerance Zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside edge of any subsurface structure.)
- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or other soft digging techniques) for the first 5-ft below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-Clearance exploratory test holes should be defined in the SOW/proposal provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternative approaches will need to be pre-approved by the OM.

- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this program. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12" for first 5 feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes performed to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.
- In addition, the following activities should be conducted:
  - Review the work scope to be performed with the site owner/tenant to determine if it may impact any utilities;
  - Attempt to procure any utility maps or historic drawings of subsurface conditions of the site;
  - **Determine the need for utility owner companies to be contacted or to have their representatives on site**;
  - Where mark-outs terminate at the property boundary, consider the use of private utility locating / GPR / geophysical-type services which may be helpful in locating utilities. Use of private utility locating firms, however, does not eliminate the legal requirement for the Excavator firm to submit a request for Public Utility Mark-outs. Also, the information provided by the service may be inaccurate and unable to locate subsurface utilities and structures in urban areas, landfills, urban fill areas and below reinforced slabs, etc. They should not be relied upon as the only means of performing utility clearance;
  - Documented description of the dig site which is included in the projects Health and Safety Plan (HASP) and one call report will be maintained in the field and distributed amongst Roux personnel its contractors and subcontractors; and
  - Documentation of the actual placement of mark outs in the field shall be collected using dated pictures, videos and/or sketches with distance from markings to fixed objects. All documentation shall be maintained within the project file.

3.2 During Intrusive Activities

The PM, field team lead or personnel performing oversight is to:

- Ensure the mark-out remains valid. (In certain states there are limits regarding the duration of time after the mark-out was applied to the ground surface work can be started or interrupted.) Additionally, the mark-outs must be maintained, documented, and in many cases refreshed periodically to be considered valid, this will be accomplished through calls to the one call center.
- Ensure intrusive activities are only performed within the safe boundaries of the mark-out as detailed in the One-Call Report.
- Halt all work if intrusive activities have resulted in discovery of an unmarked utility. Roux personnel shall notify the facility owner/operator and the one call center. All incidents such as this will be reported as per Roux Incident Investigation and Reporting Management Program.
- Halt all work if intrusive activities must take place outside of the safe boundaries of a mark-out and only proceed after new mark-outs are performed.
- Halt the intrusive activities and immediately consult with the PP if an unmarked utility is encountered.
- Completing any subsurface utility clearance incident reports that are necessary.

- If a utility cannot be found as marked Roux personnel shall notify the facility owner/operator directly or through the one call center. Following notification, the excavation may continue, unless otherwise specified in state law.
- Contractors/subcontractors must contact the one-call center to refresh the ticket when the excavation continues past the life of the ticket. Ticket life shall be dictated by state law however at a maximum ticket life shall not exceed 20 working days.

3.3 Stop Work Authority

Each Roux employee has Stop Work Authority which he or she will execute upon determination of any imminent safety hazard, emergency situation, or other potentially dangerous situation, such as hazardous weather conditions. This Stop Work Authority includes subsurface clearance issues such as the adequacy of a mark-out or identification during intrusive operations of an unexpected underground utility. Authorization to proceed with work will be issued by the PM/PP after such action is reviewed and resolved. The PM will initiate and execute all management notifications and contact with emergency facilities and personnel when this action is appropriate.

Appendix A - Definitions

Intrusive Work Activities	All activities such as digging or scraping the surface, including but not limited to, excavation, test pitting or trenching, soil vapor sampling or the installation of soil borings, soil vapor monitoring points and wells, or monitoring wells, and drilling within the basement slab of a recently demolished building.
Mark-out / Stake Out	The process of contracting with a competent and qualified company to confirm the presence or absence of underground utilities and structures. This process will clearly mark-out and delineate utilities that are identified so that intrusive work activities can be performed without causing disturbance or damage to the subsurface utilities and structures. After utility mark-outs are completed the soft digging will be completed prior to intrusive work.
Tolerance Zone	Defined as two feet on either side of the designated centerline of an identified utility, plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct backs and other non-cylindrical utilities) of that utility and two feet from the outside edge of any subsurface structure.
Structure	For the purpose of this program a structure is defined as any underground feature that may a present potential source(s) of energy such as, but not limited to, utility vaults, bunkers, piping, electrical boxes, wires, conduits, culverts, utility lines, underground tanks and ducts.
Soft Digging	The safest way to remove material from unknown obstructions or services is by using tools such as a vactor or air knife, non-mechanical tools, or hand tools. The methods are clean and non-evasive and used for uncovering and exposing buried services, excavating and for providing a quick method of soil removal from sensitive areas.
Verification	Exploratory test-hole dug with hand tools within the Tolerance Zone to expose and verify the location, type, size, direction-of-run and depth of a utility or subsurface structure. Vacuum excavation (soft dig) methods can further facilitate exposure of a subsurface utility and accurately provide its location and identification prior to intrusive work approaching the Tolerance Zone.

Appendix B - Example of Completed One Call Report

Example Completed One-Call Report

New York 811

Send To: C_EMAIL Seq No: 744

Ticket No: 133451007 ROUTINE

Start Date: 12/16/13 Time: 7:00 AM Lead Time: 20

State: NY County: QUEENS Place: QUEENS
Dig Street: 46TH AVE Address:
Nearest Intersecting Street: VERNON BLVD
Second Intersecting Street: 11TH ST

Type of Work: SOIL BORINGS
Type of Equipment: GEOPROBE
Work Being Done For: ROUX

In Street: X On Sidewalk: X Private Property: Other:
On Property Location if Private: Front: Rear: Side:

Location of Work: MARK THE ENTIRE NORTH SIDE OF THE STREET AND SIDEWALK OF: 46TH AVE BETWEEN VERNON BLVD AND 11TH STREET

Remarks:

Nad: Lat: Lon: Zone:
ExCoord NW Lat: 40.7475399 Lon: -73.9534811 SE Lat: 40.7457406 Lon: -73.9493680

Company : ZEBRA ENVIROMENTAL Best Time: 6AM-5PM
Contact Name: DAVID VINES Phone: (516)596-6300
Field Contact: DAVID VINES Phone: (516)596-6300
Caller Address: 30 N PROSPECT AVE Fax Phone: (516)596-4422
LYNBROOK, NY 11563
Email Address: david@zebraenv.com

Additional Operators Notified:
ATTNY01 AT&T CORPORATION (903)753-3145
CEQ CONSOLIDATED EDISON CO. OF N.Y (800)778-9140
MCINY01 MCI (800)289-3427
PANYNJ01 PORT AUTHORITY OF NY & NJ (201)595-4841
VZQ VERIZON COMMUNICATIONS (516)297-1602

Link to Map for C_EMAIL: http://ny.itic.occinc.com/XGMZ-DF2-L23-YAY

Original Call Date: 12/11/13 Time: 1:15 PM Op: webusr
IMPORTANT NOTE: YOU MUST CONTACT ANY OTHER UTILITIES DIRECTLY

Appendix C - Roux Subsurface Utility Clearance Checklist

Roux Subsurface Utility Clearance Checklist ***Date of Revision – 12/3/14***

Work site set-up and work execution

ACTIVITY	Yes	No	N/A	COMMENTS INCLUDING JUSTIFICATION IF RESPONSE IS NO OR NOT APPLICABLE
Daily site safety meeting conducted, SPSAs performed, JSAs reviewed, appropriate work permits obtained.				
HASP is available and reviewed by site workers / visitors.				
Subsurface Utility Clearance Procedure has been reviewed with all site workers.				
Work area secured; traffic control established as needed. Emergency shut-off switch located. Fire extinguishers / other safety equipment available as needed.				
Utility mark-outs (public / private) clear and visible. Provide Excavator's Stake-Out Reference Number / Request Date / Time.				
Tolerance zone work identified.				
Work execution plan reviewed and adhered to (ground disturbance methods, clearance depths, any special utility protection requirements, or any other execution requirements; especially for Tolerance Zone work).				
Verbal endorsement received from Roux PM for any required field deviations to work execution plan.				

<u>Key reminders for execution</u>:

The Subsurface Utility Clearance Protocol should be referenced to determine all requirements while executing subsurface work. The bullet points below are intended as general reminders only and should not be solely relied upon.

- Tolerance zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside of any subsurface structure.
- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or vacuum excavation) must be performed for the first five feet below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-clearance exploratory test holes should be defined in the SOW/proposal provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternate approaches will need to be pre-approved by the OM.
- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this program. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft

digging around the perimeter). In these cases, dig in small lifts (<12" for first five feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.

Appendix D - Utility Verification/Site Walkthrough Record

Employee Name: _____

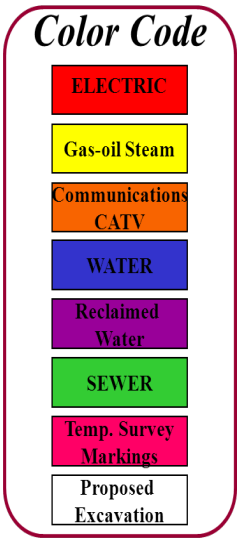
Date: _____

Instructions: For each utility suspected at the job site, indicate location on the job site, approximate burial depth, and means of detecting the utility. Leave blank if that utility is not believed to be present.

Utility	Description of Utility Location Identified Onsite	Approx. Depth (bls)	Method / Instrumentation used to determine Utility Location	Utility Owner Response (Date/Time)	Mark Out Indicates (Clear / Conflict)
Electrical Lines					
Gas Lines					
Pipelines					
Steam Lines					
Water Lines					
Sanitary and Stormwater Sewer lines					
Pressured Air-Lines					
Tank Vent Lines					
Fiber Optic Lines					
Underground Storage Tanks					
Phone Lines/ Other					

* bls - below land surface

Site Sketch Showing Utilities:



Other Comments / Findings:

Completed by: _____

Signature: _____ Date: _____

APPENDIX G

Heavy Equipment Exclusion Zone Management Program

HEAVY EQUIPMENT EXCLUSION ZONE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**07/18**
REVISION NUMBER	:	**1**

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1. PURPOSE

The purpose of the Exclusion Zone Management Program is to establish the minimum clearance distance that must be maintained between workers and heavy equipment while equipment is in operation (i.e., engaged or moving). The intent is to have no personnel or equipment entering the Exclusion Zone while the equipment is in operation or moving to ensure that Roux and Subcontractor employees are not unnecessarily exposed to the hazards of the equipment.

2. SCOPE AND APPLICABILITY

This Management Program applies to all Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") employees and their subcontractors who are performing field work and are potentially exposed to heavy equipment. For the purpose of this program, heavy equipment includes, but is not necessarily limited to: excavation equipment, drill rigs, vacuum trucks, forklifts, lull telehandlers, man lifts, bobcats, delivery trucks, etc.

3. PROCEDURES

As specified in the following sections of this Program, an Exclusion Zones must be established and maintained during activities involving the movement/operation of heavy equipment. The Exclusion Zone requirements apply to all personnel on the site but are primarily focused on those personnel who are required to be working in the vicinity of the equipment. The exclusion zone is in effect when heavy equipment is moving or engaged (ex. movement of an arm or bucket of an excavator, rotation of an auger, lifting of a load with a forklift, raising/lowering of a man lift, etc.).

1. The Exclusion Zone must meet the following minimum requirements:
   - A minimum distance of 10 feet from all heavy equipment and loads being moved by the equipment;
   - Greater than the swing/reach radius of any moving part on the heavy equipment (i.e., for large equipment this may mean an exclusion zone distance larger than 20 feet);
   - Greater than the tip-over distance of the heavy equipment; and
   - Greater than the radius of blind spots.

   The size of the Exclusion Zone will need to be determined on a task-specific basis considering the size of the heavy equipment in use and the task being performed. Prior to all heavy equipment operations, the Exclusion Zone(s) distance must be specifically identified in the Job Safety Analysis (JSA).
2. The spotter (or another individual) should be assigned responsibility for enforcing the Exclusion Zone. The spotter should be positioned immediately outside of the Exclusion Zone within a clear line of sight of the equipment operator. The spotter must signal the operator to stop work if anyone or anything has the potential to enter or compromise the Exclusion Zone. The operator should stop work if the spotter is not within his/her line of sight. If multiple pieces of equipment are being used, each piece of equipment must have its own Exclusion Zone and spotter. For large excavation and demolition projects the spotter should be in constant radio contact (not cell phone) with the machine driver.
3. If an individual must enter the Exclusion Zone, the designated Spotter must signal the Equipment Operator to stop the equipment. Once the equipment is no longer moving (ex. movement of an arm of an excavator is STOPPED, lifting of a load with a forklift STOPPED, raising/lowering of a man lift is

STOPPED, etc.), the operator must DISENGAGE THE CONTROLS and STOP and SIGNAL BY "SHOWING HIS HANDS". This signal will indicate that it is safe for the personnel to enter the limits of the Exclusion Zone to perform the required activity. The equipment must remain completely stopped/disengaged until all personnel have exited the limits of the Exclusion Zone and the designated Spotter has signaled by "SHOWING HIS HANDS" to the Equipment Operator that it is safe to resume operations.

4. When entering the limits of the Exclusion Zone, personnel must at a minimum:
   - Establish eye contact with the operator and approach the heavy equipment in a manner that is in direct line of sight to the Equipment Operator;
   - Never walk under any suspended loads or raised booms/arms of the heavy equipment; and
   - Identify a travel path that is free of Slip/Trip/Fall hazards.
5. The Exclusion Zone should be delineated using cones with orange snow fence or solid poles between the cones, barrels, tape or other measures. For work in rights-of-way rigid barriers, such as Jersey barriers or temporary chain link fence should be used. For certain types of wide-spread or moving/mobile equipment operations, such delineation may not be practicable around pieces of equipment or individual work areas. In such instances, it is expected that the entire operation will be within a larger secure work area or that additional means will be utilized to ensure security of the work zone.

All subcontractors who provide heavy equipment operations to field projects must implement a program that meets or exceeds the expectations described above as well as any additional requirements that may be required on a client or site-specific basis.

3.1 Exceptions

It is recognized that certain heavy equipment activities may require personnel to work within the limits of the Exclusion Zone as specified in this program. Such activities may include certain excavation clearance tasks, drill crew activities or construction tasks. However, any such activity must be pre-planned with emphasis on limiting the amount and potential exposure of any activity required within the zone. The critical safety steps to mitigate the hazards associated with working within the Exclusion Zone must be defined in the JSA and potentially other project-specific plans (i.e., critical lift plans, etc.), and approved by the Roux Project Principal and client representative, if required, prior to implementation.

4. TRAINING

Many Roux projects have different requirements that are client-specific or site-specific in nature. It is the responsibility of the Project Principal (or Project Manager if delegated this responsibility by the Project Principal) to ensure that the workers assigned to his/her projects are provided orientation and training with respect to these client and/or site-specific requirements.

APPENDIX H

Roux COVID-19 Interim Health and Safety Guidance

COVID-19 INTERIM HEALTH AND SAFETY GUIDANCE

CORPORATE HEALTH AND SAFETY MANAGER	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**03/2020**
REVISION DATE	:	**05/04/2020**
REVISION NUMBER	:	**3**

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B. Job Safety Analysis-Working in Areas Affected by COVID-19
C. Centers for Disease Control (CDC) Use of Cloth Face Coverings to Help Slow the Spread of COVID-19

1. PURPOSE

This guidance has been implemented to establish work practices, administrative procedures, and engineering controls to minimize potential exposure to SARS-CoV-2, the virus that causes COVID-19. The following guidance has been developed based on local, state and federal recommendations/requirements regarding COVID-19. The purpose of this document is to supplement existing site-specific Health and Safety Plans (HASPs) and provide interim health and safety guidance to minimize potential exposure to SARS-CoV-2. Should additional scientific information or regulatory information change, this document shall be updated accordingly.

2. SCOPE AND APPLICABILITY

This guidance covers all Roux employees and the subcontractors that Roux oversees. Site specific HASPs shall be developed to incorporate elements of mitigative measures against COVID-19 exposure. If work cannot be carried out in compliance with this guidance, the project shall be further evaluated by the Project Principal (PP), Office Manager (OM), and Corporate Health and Safety Manager (CHSM) prior to work authorization.

3. BACKGROUND

What is COVID-19?

COVID-19 is a respiratory illness that can spread from person to person. The virus that causes COVID-19 is a novel coronavirus that was first identified during an investigation into an outbreak in Wuhan, China. This virus continues to spread internationally and within the United States. There is currently no vaccine to prevent COVID-19.

What are the symptoms of COVID-19?

Reported illnesses have ranged from mild symptoms to severe illness and death for confirmed COVID-19 cases. Symptoms may appear 2 to14 days following exposure to the virus. People with these symptoms or combinations of symptoms may have COVID-19:

- Cough
- Shortness of breath or difficulty breathing

Or at least two of these symptoms:

- Fever
- Chills
- Repeated shaking with chills
- Muscle pain
- Headache
- Sore throat
- New loss of taste or smell

If someone develops emergency warning signs for COVID-19, they should be instructed to get medical attention immediately. Emergency warning signs can include those listed below; however, this list is not all inclusive. Please consult your medical provider for any other symptoms that are severe or concerning.

- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion or inability to arouse
- Bluish lips or face

How does COVID-19 spread?

Person-to-person spread

The virus is thought to spread mainly from person-to-person contact.

- Between people who are in close contact with one another (within about 6 feet).
- Through respiratory droplets produced when an infected person coughs, sneezes or talks.
  - These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs.
- Some recent studies suggested that COVID-19 may be spread by people who are not showing symptoms.

Spread from contact with contaminated surfaces or objects

It also may be possible that a person can get COVID-19 by touching a contaminated surface or object and then touching their mouth, nose, or possibly their eyes. Based on current data, this is not thought to be the main way the virus spreads.

According to the Centers for Disease Control and Prevention (CDC), people are thought to be most contagious when they are most symptomatic; however, there is a possibility for the virus to spread before an individual shows symptoms (asymptomatic).

How easily the virus spreads

How easily a virus spreads from person-to-person can vary. Several viruses, such as measles, are highly contagious while others do not spread as easily. Based on current data, COVID-19 spreads very easily and sustainably between people and suggests the virus is spreading more efficiently compared to influenza, but not as efficiently as measles.

4. TRAINING REQUIREMENTS

All employees with potential exposure to COVID-19 shall be provided training that incorporates COVID-19 exposure mitigation strategies, such as implementation of proper social distancing, personal hygiene (e.g., handwashing), as well as disinfection procedures, as outlined by CDC guidelines.

5. EXPOSURE RISK POTENTIAL

Worker risk of occupational exposure to COVID-19 can vary from very high, high, medium, or lower (caution) risk. This level of exposure is dependent on several factors, which can include industry type; need for contact within 6 feet of people known to be or suspected of being infected with COVID-19; density of work environment; and industrial setting (i.e., healthcare building, occupied interior work area, minimal ventilation).

Provided below is background risk level information taken from the U.S. Department of Labor Occupational Safety and Health Administration Guidance on preparing workplaces for COVID-19. Risk evaluations for each project shall be conducted by the PP and OM in consultation with the CHSM to ensure Roux employees and subcontractors remain within the lower exposure (caution) category. If it is identified there is a medium exposure risk or higher, further evaluation and mitigative measures shall be evaluated to reduce overall exposure risk prior to work authorization.

Very High Exposure Risk (Activities not conducted by Roux)

Very high exposure risk includes occupations/work activities with high potential for exposure to known or suspected sources of COVID-19 during specific medical, postmortem, or laboratory procedures. This can include but is not limited to:

- Healthcare workers (e.g., doctors, nurses, dentists, paramedics, emergency medical technicians) performing aerosol-generating procedures (e.g., intubation, cough induction procedures, bronchoscopies, some dental procedures and exams, or invasive specimen collection) on known or suspected COVID-19 patients.
- Healthcare or laboratory personnel collecting or handling specimens from known or suspected COVID-19 patients (e.g., manipulating cultures from known or suspected COVID-19 patients).
- Morgue workers performing autopsies, which generally involve aerosol-generating procedures on the bodies of people who are known to have, or suspected of having, COVID-19 at the time of their death.

High Exposure Risk (Activities not conducted by Roux)

High exposure risk occupations/work activities include exposure to known or suspected COVID-19 positive individuals. This can include but not limited to:

- Healthcare delivery and support staff (e.g., doctors, nurses, and other hospital staff who must enter patients' rooms) exposed to known or suspected COVID-19 patients. (Note: when such workers perform aerosol-generating procedures, their exposure risk level becomes very high.)
- Medical transport workers (e.g., ambulance vehicle operators) moving known or suspected COVID-19 patients in enclosed vehicles.
- Mortuary workers involved in preparing (e.g., for burial or cremation) the bodies of people who are known to have, or suspected of having, COVID-19 at the time of their death.

Medium Exposure Risk

Medium exposure risk occupations/work activities include those that require frequent and/or close contact with (i.e., within 6 feet of) people who may be infected with COVID-19, but who are not known or suspected to be COVID-19 positive. For most of our worksites, it is assumed there is on-going community transmission for COVID-19. Therefore, workers who work at sites and may have contact with the general public, other contractors, high-population-density work environments (i.e., greater than 10 people) fall within medium exposure risk group category. This can include, but is not limited to, sampling events that require two or more workers to collect and log samples in close contact or work occurring in an interior space with limited ventilation and several workers present.

Lower Exposure Risk (Caution)

Lower exposure risk (caution) occupations/work activities are those that do not require contact with people known to be or suspected of being COVID-19 positive. During these activities, there is limited contact (i.e., within 6 feet of) the general public or other workers. Workers in this category have minimal occupational contact with the public and other coworkers. This can include construction oversight that does not require close contact as well as sampling or gauging events performed by one worker.

6. EXPOSURE/SUSPECTED EXPOSURE

What do I do if I am sick or come into close contact with someone who is sick (e.g. living with/caring for)?

If you or others you are living with/caring for experience any of the following symptoms, such as acute respiratory illness (i.e., cough, shortness of breath or difficulty breathing), chills, repeated shaking with chills, muscle pain, headache, sore throat, new loss of taste or smell or fever (100.4 °F [37.8 °C]), we ask you not report to your office/field site and stay home. Employees shall notify the OM immediately so proper notifications can be made.

Additionally, if you have come into close contact (i.e., within about 6 feet for at least 15 minutes) with someone who is experiencing COVID-19-like symptoms, please notify the OM immediately. Information provided shall be used to determine appropriate internal response in consultation with the CHSM and Human Resources Director (HRD).

What if I am asked to self-isolate at home and when can I return from home isolation?

Depending on the situation, if you are COVID-19 positive or suspected to have COVID-19, employees may be required to self-isolate in their homes as per CDC or local health department guidance. As per CDC guidance, return from isolation has been broken out into two categories. The first includes confirmed or suspected COVID-19 individuals exhibiting symptoms and the second includes those who have not had COVID-19 symptoms (i.e., asymptomatic) but tested positive and are under self-isolation. Both categories, along with strategies to return from home isolation, are outlined below.

People with COVID-19 under isolation[1]:
Options include a symptom-based (i.e., time-since-illness-onset and time-since-recovery strategy) or a test-based strategy.

1) Symptom-based strategy

If you have not had a test to determine if you are still contagious, you can leave home after these three things have happened:

- At least 3 days (72 hours) have passed since recovery defined as resolution of fever without the use of fever-reducing medications; and
- improvement in respiratory symptoms (e.g., when your cough or shortness of breath have improved); and
- at least 10 days have passed since symptoms first appeared.

2) Test-based strategy

If you will be tested to determine if you are still potentially contagious, you can leave home after these three things have happened:

- Resolution of fever without the use of fever-reducing medications; and
- improvement in respiratory symptoms (e.g., when your cough or shortness of breath have improved); and
- you received two negative tests in a row, at least 24 hours apart. Your doctor shall follow CDC guidance.

People who have not had COVID-19 symptoms but tested positive and are under isolation[1]:
Options include both a time-based or test-based strategy.

1) Time-based strategy

If you have not had a test to determine if you are still contagious, you can leave home after these two things have happened:

- At least 10 days have passed since the date of their first positive COVID-19 diagnostic test; and
- you continue to have no symptoms (no cough or shortness of breath, etc.) since the positive COVID-19 diagnostic test.

2) Test-based strategy

If you have had a test to determine if you are still contagious, you can leave home after:

- You received two negative tests in a row, at least 24 hours apart. Your doctor shall follow CDC guidance.

Test-based strategies

Previous recommendations for a test-based strategy remain applicable; however, a test-based strategy is contingent on the availability of ample testing supplies and laboratory capacity as well as convenient access to testing.

[1] In all cases, follow the guidance of your healthcare provider and local health department. The decision to stop home isolation should be made in consultation with your healthcare provider and state and local health departments. Local decisions depend on local circumstances.

7. WORKPLACE CONTROLS

During the project planning phase, worksite evaluations shall be carried out by the PP and OM in consultation with the CHSM to determine risk exposure levels for work activities. If it is determined there is a medium exposure risk level or higher, additional workplace controls shall be evaluated and implemented as required in addition to the basic infection prevention measures outlined below in Section 8. Additional workplace controls can include engineering controls (i.e., ventilation, physical barriers), administrative controls (i.e., minimizing contact between workers, rotating shifts, site specific training), and additional personal protective equipment (i.e., respiratory protection). If exposure risk cannot be mitigated, potential project postponement may be necessary at the discretion of the OM in consultation with the CHSM.

A Job Safety Analysis (JSA) has been developed and is provided in Appendix B which summarizes and applies concepts within this guidance including the infection prevention measures listed below. This JSA shall be required for all field work in areas where there is community-based transmission of COVID-19.

8. INFECTION PREVENTION MEASURES

The following is basic infection prevention and personal hygiene practices which shall be implemented for all Roux field activities as well as in the office setting.

- ***Personal Hygiene***
  - Wash your hands often with soap and water for at least 20 seconds.
    - If soap and water are not available, use an alcohol-based sanitizer that contains at least 60% ethanol or 70% isopropanol.
    - Key times to wash your hands include after blowing your nose, coughing or sneezing, after using the restroom, and before eating or preparing food.
  - Do not touch your eyes, face, nose and mouth with unwashed hands.
  - Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
  - Throw potentially contaminated items (e.g., used tissues) in the trash.
- ***Avoid Close Contact/Secondary Contact with People and Potentially Contaminated Surfaces***
  - Apply appropriate social distance (6+ feet).
  - Stop handshaking—use and utilize other noncontact methods for greeting.
  - Do not work in areas with limited ventilation with other Site workers (e.g., small work trailer which lacks HVAC system). If working in a trailer, the following conditions must be met: limited to 4 workers, large enough to have the ability to apply social distance, and has open windows and/or operational HVAC to ensure proper ventilation of the workspace.
  - Morning tailgate/safety meetings shall occur outside and not within work trailers.
    - Do not require employees or subcontractors to sign in using the same tailgate form. The Site Supervisor/SHSO should record names of those in attendance on the form.
    - If the Site has more than 10 workers, separate tailgate meetings should be performed in smaller groups.
  - Do not share equipment or other items with co-workers and subcontractors unless wearing appropriate PPE (e.g. nitrile gloves). Assume equipment and other surfaces are potentially contaminated and remove gloves aseptically.
  - If receiving labware or other equipment disinfect to the extent feasible. If there are concerns for contaminating labware please wear appropriate PPE (e.g. gloves) to minimize contact.
  - Contact your lab/equipment vendor to confirm equipment is properly disinfected prior to being shipped.
  - Do not carpool with others (e.g. clients, coworkers).

- For company owned vehicles limit sharing of vehicles with coworkers. If unable to limit sharing of company owned vehicles, properly disinfect vehicle before driving with a focus on commonly touched surfaces (e.g. steering wheels, shifters, buttons, etc.).
- Use caution when using public restrooms, portable toilets. Use paper towel as a barrier when touching door handles and faucets.

- ***Cleaning and Disinfecting***
  - Clean and disinfect frequently touched surfaces daily. Commonly touched items can include but are not limited to tables, doorknobs, light switches, countertops, handles, desks, phones, keyboards, toilets, faucets, sinks, and field equipment (i.e., photo-ionization detector, field equipment).
  - **Hard (Non-porous) Surfaces**
    - If surfaces are dirty, they should be cleaned with a detergent/soap and water prior to disinfection.
    - Refer to the manufacturer's instructions to ensure safe and effective use of the product and wear appropriate personal protective equipment (e.g., gloves, safety glasses, face shield).
    - Many products require:
      - Keeping surface wet for a period of time (i.e. contact time)
        - Refer to manufacturer's instructions outlining adequate contact time.
      - Precautions such as wearing gloves and making sure you have good ventilation during use of the product.
    - Disposable gloves should be removed aseptically and discarded after cleaning. Wash hands immediately following removal of gloves. Refer to Appendix A for how to remove gloves aseptically.
    - For disinfection, diluted household bleach solutions, alcohol solutions with at least 70% alcohol, and most common EPA-registered household disinfectants should be effective.
      - Diluted household bleach solutions can be used if appropriate for the surface. Follow manufacturer's instructions for application and proper ventilation. Check to ensure the product is not past its expiration date. Never mix household bleach with ammonia or any other cleanser. Unexpired household bleach will be effective against coronaviruses when properly diluted. Leave the solution on the surface for at least 1 minute.
        - Prepare a bleach solution by mixing:
          - 5 tablespoons (1/3 cup) bleach per gallon of water or
          - 4 teaspoons bleach per quart of water
    - Products with EPA-approved emerging viral pathogen claims are expected to be effective against COVID-19. Follow the manufacturer's instructions for all cleaning and disinfecting products (e.g., concentration, application method and contact time, etc.).
  - **Soft (Porous) Surfaces**
    - For soft (porous) surfaces, remove visible contamination if present and clean with appropriate cleaners indicated for use on the surfaces. After cleaning:
      - Launder items as appropriate in accordance with the manufacturer's instructions. If possible, launder using the warmest appropriate water setting for the item and dry items completely; or
      - Use products with the EPA-approved emerging viral pathogens that claim they are suitable for porous surfaces.
  - **Electronics**
    - For electronics such as tablets, touch screens, keyboards, remote controls, etc. remove visible contamination if present.
      - Follow the manufacturer's instructions for all cleaning and disinfection products.
      - Consider use of wipeable covers for electronics.

- If no manufacturer guidance is available, consider the use of alcohol-based wipes or sprays containing at least 70% alcohol to disinfect touch screens. Dry surfaces thoroughly to avoid pooling of liquids.

- ***Linens, Clothing, and Other Items that Go in the Laundry***
  - Although it is unlikely field clothing would become potentially contaminated with COVID-19, it is recommended that field staff regularly launder field clothing following any field event upon returning home.
  - In order to minimize the possibility of dispersing the virus from potentially contaminated clothing, do not shake dirty laundry.
  - Wash items as appropriate in accordance with the manufacturer's instructions. If possible, launder items using the warmest appropriate water setting for the items and dry items completely.
  - Clean and disinfect hampers or other containers used for transporting laundry according to guidance listed above.

9. CLOTH FACE COVERINGS

The CDC recommends the use of cloth face coverings in public settings where other social distancing measures are difficult to maintain, such as grocery stores and pharmacies, and especially in areas of significant community-based transmission. This recommendation is based on recent studies and an understanding that a significant portion of asymptomatic, as well as pre-symptomatic, individuals can shed the virus to others before showing symptoms. Studies indicate that COVID-19 can spread among people interacting in close proximity through speaking, coughing, or sneezing. The purpose of the cloth covering is NOT to provide protection to the wearer, but to protect the wearer from unknowingly infecting others if they are asymptomatic/pre-symptomatic. The use of cloth face coverings is to supplement and NOT replace the existing practices outlined above.

Based on existing studies and on-going recommendations and/or requirements from federal, state, and local entities, Roux is recommending the use of cloth face coverings, when appropriate. Appropriate use is defined when local authorities or clients require the use of cloth face coverings in conjunction with established social distancing, or if an employee elects to use a cloth covering on their own accord. Roux will provide cloth face coverings that shall meet the basic requirements outlined by the CDC guidance provided in Appendix C: CDC Use of Cloth Face Coverings to Help Slow the Spread of COVID-19.

Cloth Face Coverings should:

- Fit snugly but comfortably against the side of the face;
- Be secured with ties or ear loops, when possible;
- May include multiple layers of fabric;
- Allow for breathing without restriction; and
- Be able to be laundered and machine dried with no damage or change to shape.

When donning and doffing the cloth face covering, individuals should avoid touching their eyes, nose, and mouth. Following removal of the cloth face covering, employees should wash their hands immediately using the guidelines described in Section 8 above. Cloth face coverings should be routinely washed depending on the frequency of use.

The use of existing cloth covering products/materials, such as a scarf, neck gaiter, or bandana, is deemed acceptable by the CDC. Note, the cloth face coverings recommended are not surgical masks or N-95 respirators. Those are critical supplies that must continue to be reserved for healthcare workers and other medical first responders, as recommended by current CDC guidance. Should there be a requirement for workers to be in respiratory protection (e.g. full-face respirator w/cartridges, P100, N95 respirators), it shall be addressed during the project pre-planning phase, which includes discussions with the PP and OM in consultation with CHSM.

10. HOTEL SELECTION PROCESS AND OVERNIGHT/REMOTE WORK

Hotel Selection

Due to the current COVID-19 situation, Roux is recommending overnight travel be limited to the extent possible. If there is a project requiring the overnight stay at a hotel, accommodations shall be made only after the hotel and hotel's location have been vetted in accordance with Roux's established guidance as defined below. The Project Team, which includes the Project Manager (PM) and PP along with the OM, in consultation with the CHSM, shall verify the hotel has appropriate protocols in place to limit the potential exposure and spread of COVID- 19 through proper cleaning and disinfection practices. Discussions with the hotel shall include, but are not limited to, measures taken to keep guests safe during their stay, guest room sanitization schedule, training of staff regarding disinfecting protocols using EPA-approved disinfectants, hotel staff fitness for duty requirements, etc. Following the initial hotel assessment by the Project Team, the OM and the CHSM shall review the hotel assessment findings prior to the CHSM's authorization that the hotel may be used by any Roux employees.

Employees staying overnight should abide by the following guidance:

- Ensure you properly disinfect your room upon arrival. This should include a wipe down of all commonly touched surfaces with an approved disinfectant. Use appropriate PPE (e.g. nitrile gloves) when disinfecting surfaces.
- Place the "Do Not Disturb" placard on the room while away and consider limiting hotel housekeeping service to the extent feasible (e.g., not having the room cleaned each day) to minimize potential secondary contact with others.
- Do not spend any more time in hotel common areas (i.e., lobby, hallways, etc.) than is necessary.
- Follow proper Infection Prevention Measures found within Section 8 above.
- Have meals in your hotel room after disinfecting outer package surfaces, as outlined in Section 8 above. Do not eat in public spaces or restaurants.
- If the hotel has a restaurant or café, do not have your meal in a common area; instead order food to be picked up or delivered to your room. If delivered, opt for contactless delivery (left outside the door, delivery person knocks and leaves). Always use your own pen if you need to sign something.
- Employees may also pick up food from takeout locations, order groceries or food for delivery to the hotel. Call local restaurants to order food for delivery (call the hotel lobby for recommendations) or use food ordering apps. Some apps have options for contactless delivery.

11. TRANSPORTATION-RENTAL CARS AND ROUX-OWNED VEHICLES

Rental Cars

Due to the current COVID-19 situation, Roux recommends rental car usage be limited to the extent possible. If there is a project requiring the use of a rental car (e.g. truck/van), accommodations shall be made only after the rental car company and their store's location have been vetted in accordance with Roux's established guidance, as defined below. The Project Team (PM and PP) and OM in consultation with the CHSM shall verify the rental company where you are picking up your vehicle has appropriate protocols in place to limit the potential exposure and spread of COVID- 19 through proper cleaning and disinfection practices. Discussions with the rental car company shall include, but are not limited to, measures to be taken to keep customers safe during pickup/drop-off, rental car disinfection protocols, training of staff regarding disinfecting protocols using EPA-approved disinfectants, rental car company staff fitness for duty requirements, etc. Following the initial rental car company store assessment by the Project Team, the OM and the CHSM shall review the rental car company assessment findings prior to the CHSM's authorization that the rental car company store may be used by any Roux employees.

Upon vehicle pickup, employees shall don nitrile gloves and safety glasses and clean/disinfect all high-touch surfaces (steering wheel, knobs, door handles, turn signals, radio, etc.) by wiping thoroughly with approved disinfectants (following manufacturer's instructions). Aseptically remove gloves and dispose of them along with

rags/wipes, appropriately. Wash hands or use hand sanitizer immediately after each episode of cleaning. Due to social distancing requirements, personnel shall not carpool to destinations.

Roux-Owned Vehicles

Due to the current COVID-19 situation, Roux-owned vehicles should be dedicated to individual employees to the extent feasible, and if authorized by the OM. In the case this cannot be accommodated, employees shall don nitrile gloves and safety glasses and clean/disinfect all high-touch surfaces (steering wheel, knobs, door handles, turn signals, radio, etc.) by wiping thoroughly with approved disinfectants (following manufacturer's instructions). This cleaning and disinfection shall occur before and after each use of the vehicle. Aseptically remove gloves and dispose of them along with rags/wipes, appropriately. Wash hands or use hand sanitizer immediately after each episode of cleaning. Due to social distancing requirements, personnel shall not carpool to destinations.

APPENDIX A

How to Remove Gloves

How to Remove Gloves

To protect yourself, use the following steps to take off gloves

1

Grasp the outside of one glove at the wrist. Do not touch your bare skin.

2

Peel the glove away from your body, pulling it inside out.

3

Hold the glove you just removed in your gloved hand.

4

Peel off the second glove by putting your fingers inside the glove at the top of your wrist.

5

Turn the second glove inside out while pulling it away from your body, leaving the first glove inside the second.

6

Dispose of the gloves safely. Do not reuse the gloves.

7

Clean your hands immediately after removing gloves.

APPENDIX B

Job Safety Analysis-Working in Areas Affected by COVID-19

JOB SAFETY ANALYSIS	Ctrl. No. CVD-19	DATE: 04/16/2020	☒ NEW ☐ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Fieldwork**	**Working in Areas Affected by Coronavirus**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Kristina DeLuca	Health and Safety Specialist	Brian Hobbs	CHSM

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES – Leather/cut-resistant in field and nitrile as needed
☒ HARD HAT – In field	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING – High visibility vest in field	☐ OTHER
☒ SAFETY GLASSES – In field	☒ SAFETY SHOES – Steel/composite toe in fie		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Cloth face covering, nitrile gloves, hand soap, water source, hand sanitizer, disinfectant spray and disinfectant wipes.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

SOCIAL DISTANCING: Maintain 6' of distance between yourself and all other people at all times. If you do not believe the scope of work can be conducted while maintaining this distance, contact your Project Manager immediately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Project Preplanning	N/A	• Review and follow COVID-19 CDC, Roux, Client and local orders/protocols. • Ensure all workers are fit for duty - anyone feeling sick should remain at home even if symptoms do not align with COVID-19. If a worker has been in contact with someone potentially positive or positive for COVID-19, contact your Office Manager. • Determine PPE needs and ensure adequate supply of disinfectant wipes/spray, soap and water or hand sanitizer at Site. Due to high demands and limited supply, plan ahead. • Use the minimum number of employees necessary to safely complete the work.
2. Mobilization	**Exposure:** Becoming infected or infecting co-workers	**Personal/Rental/Roux Owned Vehicle** • Do not carpool. • Use the same vehicle every day and do not share with co-workers. • Verify workers/other people are not approaching vehicle prior to exiting the vehicle. Maintain 6' of distance from others. • DO not valet your car or allow others to use your car. If necessary, don nitrile gloves and safety glasses and clean/disinfect all high touch surfaces (steering wheel, knobs, door handles, turn signals, radio, etc.) by wiping thoroughly with approved disinfectants (follow manufacturer's instructions). This cleaning and disinfection shall occur before and after each use of the vehicle. Aseptically remove gloves and dispose of them along with rags/wipes, appropriately. Wash hands or use hand sanitizer immediately after each episode of cleaning. **Public Transportation** • Public transit should not be used unless absolutely necessary. Consider renting a car rather than taking public transit. If public transit is required, wear appropriate PPE and apply social distancing (6 ft). Use proper donning and doffing procedures for nitrile gloves. Wash hands or use hand sanitizer immediately after. **Hotel Stay (Refer to COVID-19 H&S Guidance for more info)** • If a hotel stay is deemed necessary for the given field work, ensure that you disinfect your room upon initial arrival and returning each day. Disinfect all surfaces of your room with an appropriate disinfectant using nitrile gloves. Use proper donning and doffing procedures for nitrile gloves. • Place the "Do Not Disturb" placard on the room while away and limit housekeeping services to the extent feasible during your stay to minimize the reintroduction and spread of the virus from others. Minimize, or avoid entirely, time spent in hotel common areas (i.e., the lobby, dining areas, gyms, etc.). Wash hands or use hand sanitizer often.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards, energy source; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

3. Tailgate Meeting	**Exposure:** Becoming infected or infecting co-workers	• Must occur outside or remotely (i.e. video or conference call). • Maintain at least a 6+ ft distance between you and others. • Discuss primary infection prevention measures listed below. • Do not require employees or subcontractors to sign in, the Site Supervisor shall record names on the attendance form. • If the Site has more than 10 workers, separate tailgate meetings should be performed. • Discuss COVID-19 symptoms with coworkers and subcontractors to ensure fitness for duty. Anyone exhibiting signs or symptoms should be instructed to leave the Site, contact your Project Manager.
4. Site Activities	**Exposure:** Becoming infected or infecting co-workers	• Coordinate field activities at the beginning of the day (i.e. Tailgate meeting) to minimize time spent in crowded spaces or overlap while completing job tasks. • Don cloth face coverings as appropriate. • Apply social distancing (6+ ft) when interacting with others. If anyone comes within 6 ft of you while conducting work and your work prevents you from moving away, politely ask them to move back. If others are unable to move from your space, stop work and leave area. • Do not shake hands or touch others. • Do not share equipment or other items with co-workers and subcontractors unless wearing appropriate PPE (e.g. nitrile gloves). Assume equipment and other surfaces are potentially contaminated and remove gloves aseptically (See Appendix A of Roux Interim H&S Guidance for proper glove removal). • If anyone is coughing or sneezing in your vicinity, stop work and leave the area. • Do not work in areas with limited ventilation with others. • Cover your mouth and nose with tissue or paper towel or with your elbow when coughing or sneezing and wash hands or use hand sanitizer immediately after. If sick contact SHSO/PM and leave Site immediately. • Disinfect work surfaces/areas with approved disinfectant you're responsible for (ex: desk, office doorknob, computer, etc.) at least once at the beginning of your shift and at least once at the end of your shift with either sanitizing wipes or disinfectant spray. • Phones should be operated hands free to extent feasible. Sanitize your phone on a regular basis. Disinfection should also take place whenever suspected contaminated material comes in contact with any work surfaces/areas. Wash hands or use hand sanitizer immediately after. • Avoid public spaces and going out to eat by bringing your own lunch to the Site. If performing work in high density urban areas, it is recommended all food must be consumed at or in your vehicle. Wash hands or use hand sanitizer before eating and immediately after.

Primary Infection Prevention Measures

- Wash your hands often with soap and water for at least 20 seconds.
  - If soap and water are not available, use an alcohol-based sanitizer that contains at least 60% ethanol or 70% isopropanol. Key times to wash hands include after blowing your nose, coughing or sneezing, after using the restroom, and before eating or preparing food.
- Do not touch your eyes, face, nose and mouth with unwashed hands.
- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw potentially contaminated items (e.g. used tissues) in the trash.
- Avoid close contact/secondary contact with people and potentially contaminated surfaces.
  - Apply appropriate social distance (6+ feet).
  - Stop handshaking/touching others and use caution when accessing public spaces.
- Clean and disinfect frequently touched surfaces daily. Commonly touched items can include but are not limited to tables, doorknobs, light switches, countertops, handles, desks, phones, keyboard, toilets, sinks and field equipment. If surfaces are dirty, they should be cleaned with soap and water prior to disinfection. If surface cannot be cleaned/disinfected, then wash hands or use sanitizer as soon as possible.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

APPENDIX C

Centers for Disease Control (CDC)
Use of Cloth Face Coverings to Help Slow the Spread of COVID-19

Use of Cloth Face Coverings to Help Slow the Spread of COVID-19

How to Wear Cloth Face Coverings

Cloth face coverings should—

- fit snugly but comfortably against the side of the face
- be secured with ties or ear loops
- include multiple layers of fabric
- allow for breathing without restriction
- be able to be laundered and machine dried without damage or change to shape

CDC on Homemade Cloth Face Coverings

CDC recommends wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain (e.g., grocery stores and pharmacies), **especially** in areas of significant community-based transmission.

CDC also advises the use of simple cloth face coverings to slow the spread of the virus and help people who may have the virus and do not know it from transmitting it to others. Cloth face coverings fashioned from household items or made at home from common materials at low cost can be used as an additional, voluntary public health measure.

Cloth face coverings should not be placed on young children under age 2, anyone who has trouble breathing, or is unconscious, incapacitated or otherwise unable to remove the cloth face covering without assistance.

The cloth face coverings recommended are not surgical masks or N-95 respirators. Those are critical supplies that must continue to be reserved for healthcare workers and other medical first responders, as recommended by current CDC guidance.

Should cloth face coverings be washed or otherwise cleaned regularly? How regularly?

Yes. They should be routinely washed depending on the frequency of use.

How does one safely sterilize/clean a cloth face covering?

A washing machine should suffice in properly washing a cloth face covering.

How does one safely remove a used cloth face covering?

Individuals should be careful not to touch their eyes, nose, and mouth when removing their cloth face covering and wash hands immediately after removing.

cdc.gov/coronavirus

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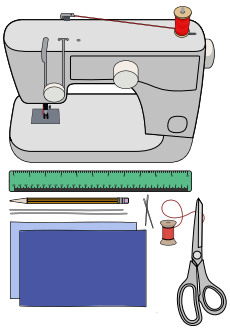
Sewn Cloth Face Covering

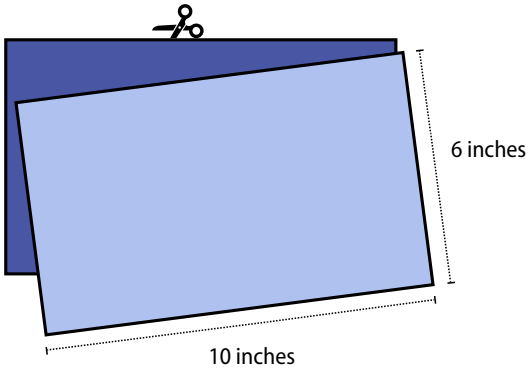
Materials

- Two 10”x6” rectangles of cotton fabric
- Two 6” pieces of elastic (or rubber bands, string, cloth strips, or hair ties)
- Needle and thread (or bobby pin)
- Scissors
- Sewing machine

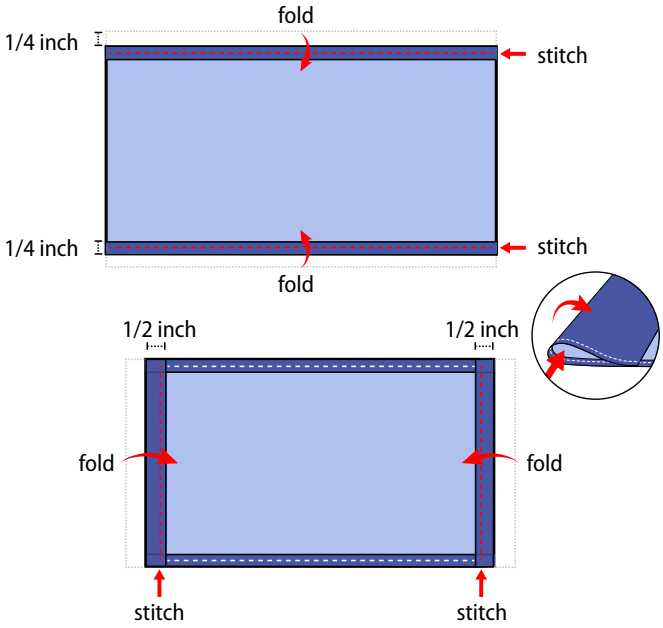


Tutorial

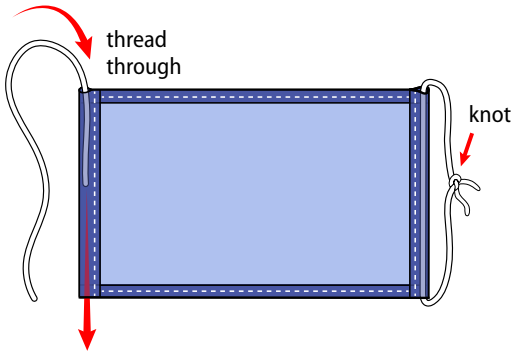
1. Cut out two 10-by-6-inch rectangles of cotton fabric. Use tightly woven cotton, such as quilting fabric or cotton sheets. T-shirt fabric will work in a pinch. Stack the two rectangles; you will sew the cloth face covering as if it was a single piece of fabric.



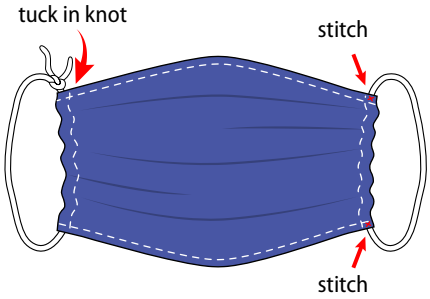
2. Fold over the long sides ¼ inch and hem. Then fold the double layer of fabric over ½ inch along the short sides and stitch down.



3. Run a 6-inch length of 1/8-inch wide elastic through the wider hem on each side of the cloth face covering. These will be the ear loops. Use a large needle or a bobby pin to thread it through. Tie the ends tight.
Don’t have elastic? Use hair ties or elastic head bands. If you only have string, you can make the ties longer and tie the cloth face covering behind your head.



4. Gently pull on the elastic so that the knots are tucked inside the hem.
Gather the sides of the cloth face covering on the elastic and adjust so the mask fits your face. Then securely stitch the elastic in place to keep it from slipping.



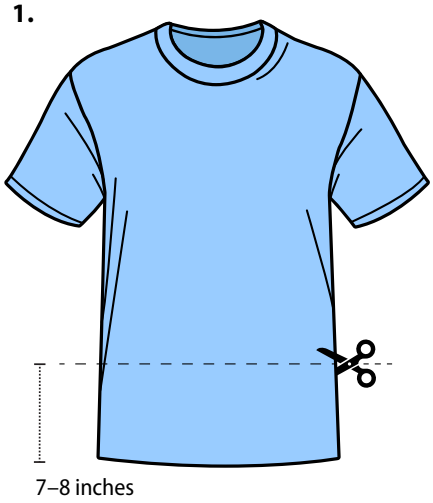
Quick Cut T-shirt Cloth Face Covering (no sew method)

Materials

- T-shirt
- Scissors

Tutorial

1.



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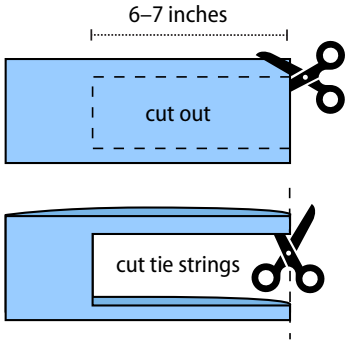

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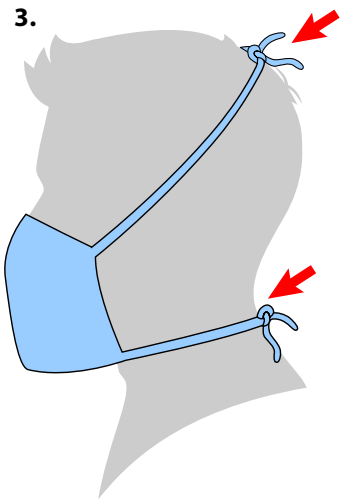


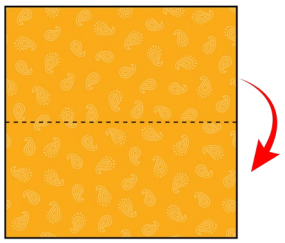
Bandana Cloth Face Covering (no sew method)

Materials

- Bandana (or square cotton cloth approximately 20″x20″)
- Rubber bands (or hair ties)
- Scissors (if you are cutting your own cloth)

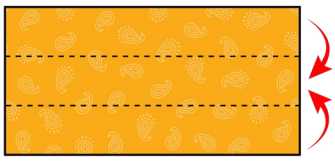
Tutorial

1.



Fold bandana in half.

2.

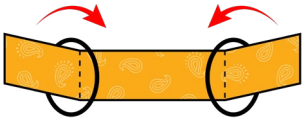


Fold top down. Fold bottom up.

3.

Place rubber bands or hair ties about 6 inches apart.

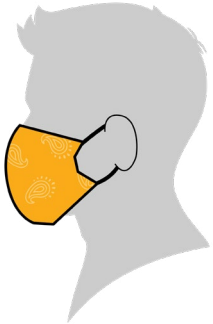
4.



Fold side to the middle and tuck.

5.

6.



APPENDIX I

CDC's Face Covering Procedure

Use of Cloth Face Coverings to Help Slow the Spread of COVID-19

How to Wear Cloth Face Coverings

Cloth face coverings should—

- fit snugly but comfortably against the side of the face
- be secured with ties or ear loops
- include multiple layers of fabric
- allow for breathing without restriction
- be able to be laundered and machine dried without damage or change to shape

CDC on Homemade Cloth Face Coverings

CDC recommends wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain (e.g., grocery stores and pharmacies), **especially** in areas of significant community-based transmission.

CDC also advises the use of simple cloth face coverings to slow the spread of the virus and help people who may have the virus and do not know it from transmitting it to others. Cloth face coverings fashioned from household items or made at home from common materials at low cost can be used as an additional, voluntary public health measure.

Cloth face coverings should not be placed on young children under age 2, anyone who has trouble breathing, or is unconscious, incapacitated or otherwise unable to remove the cloth face covering without assistance.

The cloth face coverings recommended are not surgical masks or N-95 respirators. Those are critical supplies that must continue to be reserved for healthcare workers and other medical first responders, as recommended by current CDC guidance.

Should cloth face coverings be washed or otherwise cleaned regularly? How regularly?

Yes. They should be routinely washed depending on the frequency of use.

How does one safely sterilize/clean a cloth face covering?

A washing machine should suffice in properly washing a cloth face covering.

How does one safely remove a used cloth face covering?

Individuals should be careful not to touch their eyes, nose, and mouth when removing their cloth face covering and wash hands immediately after removing.

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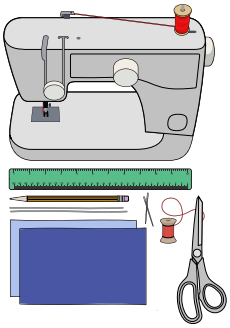
Sewn Cloth Face Covering

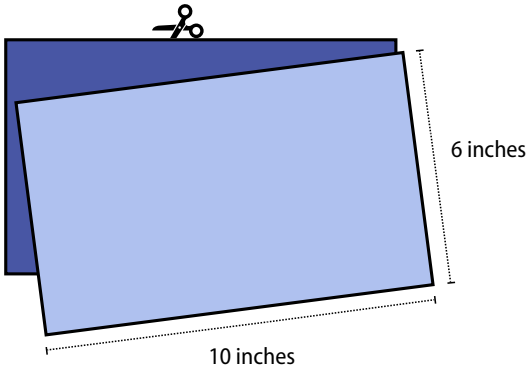
Materials

- Two 10”x6” rectangles of cotton fabric
- Two 6” pieces of elastic (or rubber bands, string, cloth strips, or hair ties)
- Needle and thread (or bobby pin)
- Scissors
- Sewing machine

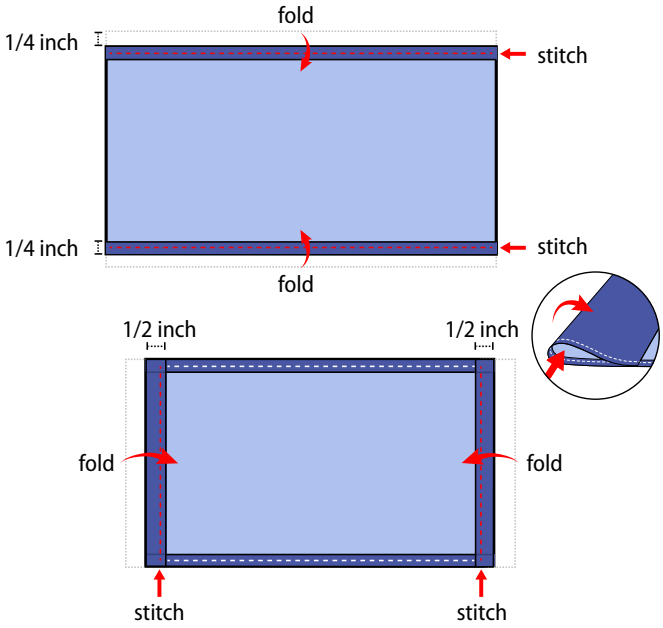


Tutorial

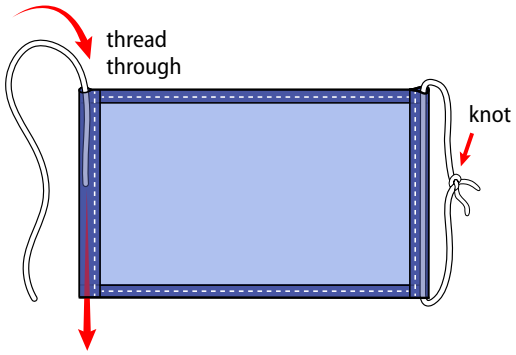
1. Cut out two 10-by-6-inch rectangles of cotton fabric. Use tightly woven cotton, such as quilting fabric or cotton sheets. T-shirt fabric will work in a pinch. Stack the two rectangles; you will sew the cloth face covering as if it was a single piece of fabric.



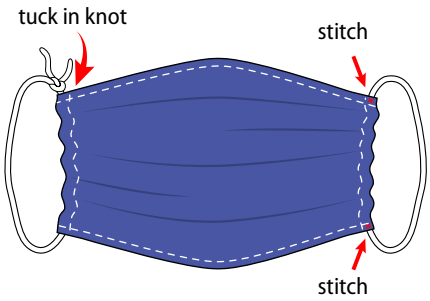
2. Fold over the long sides ¼ inch and hem. Then fold the double layer of fabric over ½ inch along the short sides and stitch down.



3. Run a 6-inch length of 1/8-inch wide elastic through the wider hem on each side of the cloth face covering. These will be the ear loops. Use a large needle or a bobby pin to thread it through. Tie the ends tight.
Don’t have elastic? Use hair ties or elastic head bands. If you only have string, you can make the ties longer and tie the cloth face covering behind your head.



4. Gently pull on the elastic so that the knots are tucked inside the hem.
Gather the sides of the cloth face covering on the elastic and adjust so the cloth face covering fits your face. Then securely stitch the elastic in place to keep it from slipping.



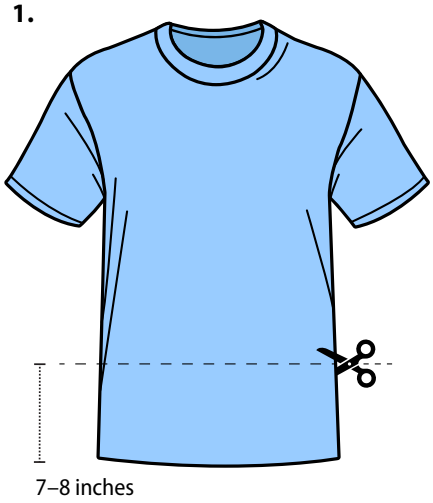
Quick Cut T-shirt Cloth Face Covering (no sew method)

Materials

- T-shirt
- Scissors

Tutorial

1.



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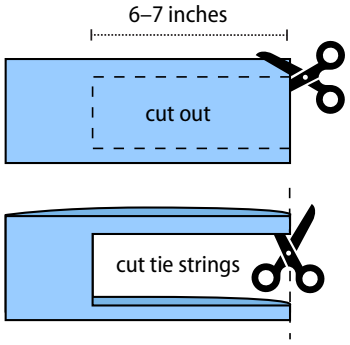

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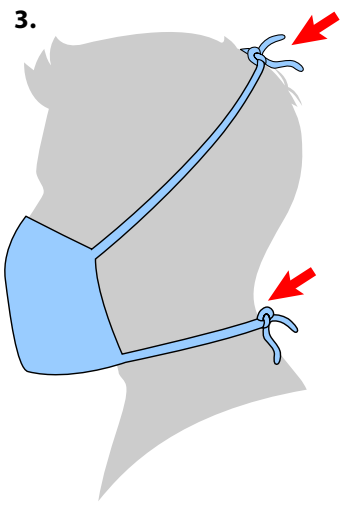


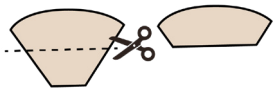
Bandana Cloth Face Covering (no sew method)

Materials

- Bandana (or square cotton cloth approximately 20”x20”)
- Coffee filter
- Rubber bands (or hair ties)
- Scissors (if you are cutting your own cloth)

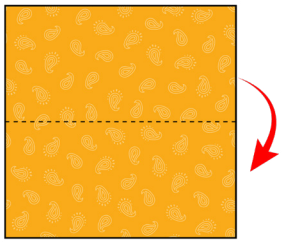
Tutorial

1.

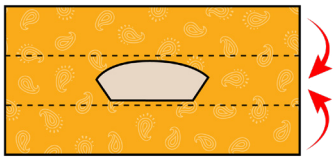


cut coffee filter

2.



3.



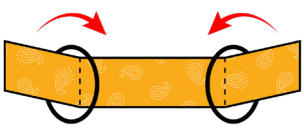
Fold filter in center of folded bandana.

Fold top down. Fold bottom up.

4.

Place rubber bands or hair ties about 6 inches apart.

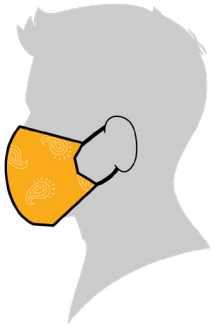
5.



Fold side to the middle and tuck.

6.

7.



APPENDIX G

Site Management Forms

ROUX ENVIRONMENTAL ENGINEERING AND GEOLOGY D.P.C.

SITE-WIDE MONITORING, INSPECTION, AND MAINTENANCE FORM

Client: **BOP 2401 Third Avenue, LLC**

Location: **2401 Third Avenue, Bronx, 10451**

Inspector: _____

Date: _____

_____

Site Observations:

Yes	No	
[ ]	[ ]	Have any site improvements been made since the last inspection?
[ ]	[ ]	Has there been any maintenance activity impacting the institutional and/or engineering controls?
		-Include sketches or photos of observations

Inspection of Stone Cap:

Yes	No	
[ ]	[ ]	Is the underlying demarcation barrier exposed? If yes, refer to Page 3 for additional clarification.

Inspection of Building Covers and Asphalt/Concrete Caps:

Yes	No	
[ ]	[ ]	Were all buildings inspected?
[ ]	[ ]	Were significant cracks observed?
[ ]	[ ]	Was any other damage observed? If yes, refer to Page 3 for additional clarification.
[ ]	[ ]	Were any new slab penetrations observed? If yes, include description on Page 3.
		-Include sketches or photos of observations

Inspection of Groundwater Usage:

Yes	No	
[ ]	[ ]	Is groundwater underlying the property being used for any purposes including, but not limited to, drinking water or industrial purposes?

Include additional information and details on Page 3 of this inspection form if the response to any of the above questions warrants additional explanation.

ROUX ENVIRONMENTAL ENGINEERING AND GEOLOGY D.P.C.

SITE-WIDE MONITORING, INSPECTION, AND MAINTENANCE FORM

Client: **BOP 2401 Third Avenue, LLC**

Location: **2401 Third Avenue, Bronx, 10451**

Inspector: _____

Date: _____

_____

Inspection of Remaining Contaminated Material:

Yes	No	
[ ]	[ ]	Have there been any activities that caused a disturbance of remaining contaminated material since the last inspection?
[ ]	[ ]	If yes, were the activities conducted in accordance with the Site Management Plan (SMP)? -Include sketches or photos of observations

Inspection of Gardens and Farming:

Yes	No	
[ ]	[ ]	Is there any evidence of vegetable gardens and/or farming at the property (aside from raised planters)? -Include sketched or photos of observations.

Site Records:

Yes	No	
[ ]	[ ]	Are site records up to date (e.g., Site Inspection Checklists)?

Inspection of Property Usage:

Yes	No	
[ ]	[ ]	Is the property being used for any purposed other than restricted residential, commercial, and/or industrial use?

Include additional information and details on Page 3 of this inspection form if the response to any of the above questions warrants additional explanation.

ROUX ENVIRONMENTAL ENGINEERING AND GEOLOGY, D.P.C.

SITE-WIDE MONITORING, INSPECTION, AND MAINTENANCE FORM

Client: **BOP 2401 Third Avenue, LLC**

Location: **2401 Third Avenue, Bronx, 10451**

Inspector: _____

Date: _____

Site Observations

Additional Comments or Clarification Where Corrective Actions May Be Required: