3083 WEBSTER AVE BCP SITE

3083 WEBSTER AVENUE

BRONX, NEW YORK

Remedial Action Work Plan

NYSDEC BCP Number: C203184

Prepared for:

6014 BCD Realty, LLC
1144 Evergreen Avenue, Suite #1
Bronx, NY 11472

Prepared by:

Hydro Tech Environmental Engineering and Geology, DPC
231 West 29th Street, Suite 1104
New York, NY 10001

JUNE 2026

CERTIFICATION STATEMENT

I, Tarek Z. Khouri, certify that I am currently a NYS registered professional engineer and that this Remedial Action Work 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) and Green Remediation (DER-31).

086611	06-01-2026	
NYS Professional Engineer #	Date	Signature

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LIST OF ACRONYMS

Acronym	*Definition*
Cis-1,2-DCE	Cis-1,2-Dichloroethylene
AOC	Area of Concern
BGS	Below Sidewalk Grade
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CPP	Citizen Participation Plan
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
CVA	Climate Vulnerability Assessment
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
FT	Feet
GSR	Green and Sustainable Remediation
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
IRM WP	Interim Remedial Measure Work Plan
MNA	Monitored Natural Attenuation
MTBE	Methyl Tertiary Butyl Ether
NOC	Notice of Completion
NYC BCP	New York City Brownfield Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations

NYC OER	New York City Office of Environmental Remediation
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYC DOB	New York City Department of Building Construction
NYS DOT	New York State Department of Transportation
ORCA	Oxygen-Release Compound Advanced
OSHA	United States Occupational Health and Safety Administration
PAH	Poly Aromatic Hydrocarbons
PCE	Tetrachloroethylene
PE	Professional Engineer
PFAS	Per-And Polyfluoroalkyl Substances
PFOS	Perfluorooctanesulfonic Acid
PFOA	Perfluorooctanoic Acid
PGWSCOs	Protection of Groundwater Soil Cleanup Objectives
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SEFA	Spreadsheets for Environmental Footprint Analysis

SOE	Support of Excavation
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semi-Volatile Organic Compound
TCE	Trichloroethylene
Trans-1,2-DCE	Trans-1,2-Dichloroethylene
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WR	Well screened in weathered rock
WR/BR	Well Screened in Weathered Rock/Competent Bedrock

EXECUTIVE SUMMARY

SITE DESCRIPTION/PHYSICAL SETTING/SITE HISTORY

6014 BCD Realty, LLC filed an application to enter the Brownfield Cleanup Program (BCP) Agreement with the New York State Department of Environmental Conservation (NYSDEC) as a Volunteer for a site located at 3083 Webster Avenue in Bronx, New York and identified on the New York City Tax Map as tax block 3331 and lot 57 (the "Site"). A Brownfield Cleanup Agreement (BCA) was executed between 6014 BCD Realty, LLC as Volunteer and NYSDEC on June 9, 2025. A Site name listed as 3083 Webster Ave BCP Site and a number C203184 were issued to this BCP Site.

The Site, approximately 15,000 square ft (0.34 acres), is located in a residential and commercial area and consists of a parcel with two one-story vacant buildings in the northwestern and central portions and is secured by a plywood construction fence along Webster Avenue. The Site had been used since at least 1940's as a gasoline service station and auto repair facilities until it became vacant in 2021. A gasoline dispenser canopy is still located in the southern portion of the Site and is surrounded by asphalt paved surfaces with some areas consisting of gravel as a result of backfilling activities related to former underground petroleum tanks closure in August 2021.

Based on the findings of a December 2023 Phase I Environmental Site Assessment (ESA) prepared by CA RICH Geology Services, D.P.C. (CA RICH), the Site was developed during 1896 with a three-story building until 1900. In 1927 it was listed as auto supplies and from 1940 to 2021 the Property was listed as an auto repair and/or service station. According to previous environmental investigations performed at the Site, the historic auto repairs and service station were responsible for the current contamination identified at this Site. Fifteen closed NYSDEC spill numbers are associated with the historic uses at the Site and included a tank test failure in 2002 (Spill number 9106593), minor petroleum and antifreeze spills on concrete in 2004, 2005, 2006, 2007 and 2023 (Spill numbers 0402479, 0505304, 0513516, 0514557, 0613953, 0604640, 0703246, 0612394, 0612429, 0602646, 0905693), tanks overfill in 2005 (Spill number 0504396), and identification of sub-subsurface impact during tanks closure activities in 1998

(Spill number 9711128) and in 2021 (Spill number 2105015). The Site is also associated with a Petroleum Bulk Storage (PBS) registration number 2-325953 for nine underground storage tanks (USTs) that were closed and removed during January and February 1998 including six 550-gallon gasoline USTs and one 4,000-gallon gasoline UST located in a gasoline tank field in the eastern portion of the Site, one 550-gallon waste oil UST located in the northeastern portion, and one 550-gallon fuel oil UST located in the northwestern portion, and also two 4,000-gallon gasoline UST that were closed and removed in 2001. The Site PBS registration also includes two individual 240-gallon fuel and waste soil oil aboveground storage tanks (ASTs) that were both closed and removed in 2024.

The Site is bordered by multiple 2 to 5 stories residential buildings to the north, west and south and to the east by Webster Avenue followed by a 1-story autobody repair facility, an 11-story residential building, and two day-care facilities. Surrounding properties within a half mile (2,650 ft) radius of the Site consist of residential, commercial, and vacant lands.

SUMMARY OF THE REMEDIAL INVESTIGATION

The following reports provide a summary of the previous environmental investigations and samplings conducted at the Site, which includes:

- Tank Closure Report prepared by Tyree Brother's Environmental Services, Inc. (Tyree) dated May 30, 1998, and NYSDEC correspondence dated August 12, 1998.
- Subsurface Investigation Report prepared by Tyree and dated November 1, 2009.
- Tank Closure and Remediation Excavation Report prepared by LaBella Associates, D.P.C. (Labella) and dated October 11, 2021
- Phase II Sub-Surface Investigation Report prepared by Advantage Environmental Consultants LLC (AEC) and dated January 7, 2022.
- Draft Remedial Investigation Report (RIR) prepared by HydroTech and dated August 29, 2024.
- RIR prepared by HydroTech and dated March 2026.

The above-referenced investigations focused on the following areas of concern for this Site:

- The historic use of the Site as auto repair and gas station;
- The presence of a conditionally closed NYSDEC spill case with elevated levels of petroleum VOCs in soil and groundwater in exceedance of regulatory standards;
- The presence of chlorinated VOCs identified soil vapors and groundwater beneath the Site.

The general sampling scope for each previous investigation is summarized as follows:

Tank Closure under PBS #2-325953 by Tyree in 1998

- Collection of nine (9) confirmatory end-point soil samples (Sample 1 through Sample 9) included six (6) sidewall samples at 5 ft below ground surface (bgs), and one (1) bottom sample at 8 ft bgs beneath the two 4,000-gallon gasoline USTs, and two (2) bottom samples at 7 ft bgs beneath the six 550-gallon gasoline USTs.
- Collection of one (1) composite bottom end-point sample (Sample 1) from the tank pit for 550-gallon waste oil UST.
- No end-point samples were collected from the tank pit of the fuel oil tank.
- All the collected soil samples were analyzed for VOCs via EPA Method 8021 and methyl tert-butyl ether (MTBE). The waste composite sample was also analyzed for RCRA metals.

Subsurface Investigation by Tyree between 1998 and 2009 in response to NYSDEC's Correspondence for Spill #9711128 (closed on June 5, 2012) dated August 12, 1998)

- Installation of five (5) groundwater monitoring wells designated as MW-1 through MW-5 in the four corners and the center of the Site in 1998 and collection of twenty (20) groundwater samples in four rounds of quarterly sampling between May 2002 and

November 2009 to determine the groundwater flow direction and to evaluate the groundwater quality underneath the Site.

- Performance of two (2) rounds of Enhanced Fluid Recovery (EFR) events in MW-4 in southern corner of the Site in 2000 and 2001.
- Installation of six (6) soil probes (designated as SB-1 through SB-6) including one in the mid-northern portion and five in the southern portion of the Site and collection of six (6) soil samples to evaluate soil quality. The samples from these soil probes were collected variable depths intervals ranging between 10-13 ft bgs to 25-27 ft bgs.
- Conversion of two (2) soil probes (SB-2 and SB-3) in the southeastern portion of the Site into temporary monitoring wells and collection of two (2) groundwater samples to evaluate groundwater quality.
- The soil samples were analyzed for VOCs via EPA Method SW8260C (STARS/CP-51 list). Soil samples were also analyzed for SVOCs via EPA Method SW8270D (STARS/CP-51 list).

Tank Closure under PBS #2-325953 in August 2021 and Limited Remedial Excavation for Spill #2105015 (closed on February 16, 2022) in September 2021 by LaBella

- Collection of eleven (11) end-point samples following removal of two (2) 4,000-gallon gasoline USTs and related two (2) gasoline dispensers and distribution pipelines located in the southern portion of the Site including four (4) shallow sidewall samples (PE-1 through PE-4) at 5-6 ft and 7-8 ft bgs, four (4) deep sidewall samples (LB-1 through LB-4) at the base of the tank pad at 11-12 ft bgs, two (2) dispenser end-point samples (Disp-1 and Disp-2) at 2-3 ft bgs and 3-4 ft bgs and one (1) product line end-point (PL-1) at 2-3 f bgs.
- Collection of three (3) end-point samples (PE-5 through PE-7) following further soil excavation underneath the product line at 3-5 ft bgs.
- Collection of one (1) soil sample (TP-1) from a test pit installed down to 18 ft bgs in-between the tank pit and the dispenser island in the southeastern portion of the Site.

- Collection of one (1) groundwater sample (GW-1) by advancing the test pit down to 20 ft bgs.
- The soil and groundwater samples were analyzed for VOCs and SVOCs (CP-51 list).

Phase II Sub-Surface Investigation in December 2021 by AEC

- Installation of six (6) soil probes (B-1 through B-6) across the Site and collected six (6) soil samples between 9 and 20 ft bgs to evaluate the soil quality. The soil samples were analyzed for VOCs and SVOCs (CP-51 list).

Remedial Investigation in August 2024 by HydroTech

This investigation was performed in accordance with NYCOER-approved RI work plan addressing the E-249 designation for hazardous material assigned to this Site:

- Performance of a geophysical survey to identify any USTs' anomalies;
- Installation of eight (8) soil probes to depths that corresponded to the proposed excavation for the layout of a new building foundations including six soil probes designated as SP-2 to SP-7 installed to the depth of 12 ft bgs and one soil probe designated SP-8 installed to the depth of 18 ft bgs. Two soil probes designated as SP-1 and SP-6 were installed outside the proposed building footprint to the depth of 4 ft bgs. Sixteen soil samples were collected including eight shallow samples from 0-2 ft bgs, one sample from each 2-4 ft bgs and 16-18 ft bgs and five samples from 10-12 ft bgs. All samples were analyzed for VOCs via EPA 8260B, SVOCs via EPA 8270D, pesticides via EPA Method 8081B, PCBs via EPA Method 8082A and metals (including hexavalent and trivalent chromium) via EPA Method 6010C, EPA Method 7471 and EPA Method 7196A. Four soil samples obtained from SP-4 and SP-8 at 0-2 ft bgs and 10-12 ft bgs were analyzed for per- and polyfluoroalkyl substances (PFAS) via EPA Method 1633.
- Installation of four (4) temporary groundwater monitoring wells to the depth of Geoprobe refusal. All four monitoring wells were determined to be dry, and no groundwater samples were collected.

- Installation of five (5) soil vapor points (SV-1 to SV-5) within the footprint of the proposed development. Two of these soil vapor probes, SV-2 and SV-4, were nested and were identified as SV-2A, SB-2B and SV-4A, SV-4B. A total of seven soil vapor samples were collected including five samples obtained from SV-1, SV-2A, SV-3, SV-4A and SV-5 at 12 ft bgs and two samples were collected from SV-2B and SV-4B at 6 ft bgs and were analyzed for VOCs via EPA Method TO-15.

Remedial Investigation in July/August 2025 and December2025/January 2026 by HydroTech

This investigation was performed under the Brownfield Cleanup Program in accordance with NYSDEC-approved RIWP dated March 4, 2025, RIWP Addendum dated July 18, 2025, and Supplemental RIWP dated December 04, 2025:

- Installation of twelve (12) soil probes (SP-9 through SP-20) to 26 to 46 ft bgs across the Site. Specifically, SP-9 was installed at the western corner of the Site in the vicinity of previous soil probe SP-2, SP-10 and SP-18 at the northern corner in the vicinity of previous soil probe SP-6, SP-11 at the eastern corner, SP-12 at the southern corner, SP-13 in the central portion of the Site in the vicinity of previous soil probe SP-4, SP-14 in the southeastern portion in the vicinity of previous soil probe SP-7, SP-15 in the southwestern portion in the vicinity of previous soil vapor points SV-2A and SV-2B, SP-16 and SP-18 in the northwestern portion, and SP-17 and SP-20 at the location of the former auto repair shop in the central portion of the Site. Collection of fourteen (14) soil samples from the installed soil probes including five (5) samples from the shallow layer between zero and 2 ft bgs and nine (9) samples from the two-foot interval above the boulder refusal ranging from 5-7 ft bgs to 16-18 ft bgs.
- Installation of twelve (12) monitoring wells (MW-1a to MW-5a and MW-6 to MW-12) across the Site, of which four wells consisted of bedrock wells with a 4-inch steel casing was driven through the overburden formation to approximately 2 ft into the competent rock at MW-2a and to 5 ft into the bedrock at MW-10 to MW-12, and collection of twelve (12) groundwater samples from the installed monitoring wells.

- Installation of seven (7) soil vapor probes (SV-1R – SV-5R, SV-6 and SV-7) at the original locations of SV-1 through SV-5 during August 2024 RI and central portion and northwestern portion of the Site. Collection of thirteen (13) soil vapor samples including two samples from each soil vapor probes including SV-1R, SV-2R, SV-4R, SV-5R and SV-7, one sample from each soil vapor probe at SV-3R and SV-6 and one duplicate sample from SV-7. The vapor samples were analyzed for VOCs via EPA Method TO-15.
- Performance of a borehole geophysical logging at the boring's locations of SP-18/MW-11, SP-19/MW-11 and SP-20/MW-12 to study the influence of hydrogeological features of the underlying bedrock on the water flow beneath the Site and delineate the CVOCs contaminants detected in MW-2a.

Findings of the Previous Investigations

Overall findings of Tyree Subsurface Investigation (2009), Labella Tank Closure (2021), and HydroTech the RI (2024 and 2025/2026) indicate the following:

1. Elevation of the property is approximately 86 ft above mean sea level. The Site topography is uneven, and it declines from the north to the south by an average of 4 ft; from NAVD88 elevation (el.) between 88.78 ft el. in the northern portion to elevation ranging between 90.47 ft el. to 85.39 ft el. to 85.79 ft el. in the southern portion. The ground level at the Site also declines from the west to east by an average of 1.69 ft; from elevation ranging between 88.78 ft el. to 90.47 ft el. in the western portion to elevation ranging between 85.39 ft el. to 85.79 ft el. in the eastern portion.
2. Depth to groundwater beneath the Site was measured across three distinct intervals and ranges between 22.33 ft and 26.17 ft in overburden material/weathered bedrock, between 16.23 ft and 24.7 ft in weathered bedrock/competent bedrock, and between 13.44 ft and 24.14 ft in competent bedrock. The decreased water level in the bedrock wells is influenced by the static wellhead pressure from deep transmissive (water-bearing) bedrock fractures identified during a borehole geophysical logging exercise.
3. The groundwater flow direction beneath the Site is mapped separately across three distinct intervals and it was determined toward the west in the overburden material/weathered

bedrock, toward the southwest in weathered bedrock/competent bedrock, and toward the northwest in the competent bedrock.

4. No anomalies indicative of suspect USTs was identified during geophysical surveys at the Site. All the USTs and their related piping systems were removed from the Site in 1998 and 2021.
5. The stratigraphy beneath the Site consists of fine to coarse grained silty sand with pebbles and rocks. Evidence of fill material consisting of concrete, asphalt, bricks, and charcoal was identified in soil probes between zero to 4 ft bgs. Overburden formation of weathered rock consisting of poorly grained sand was encountered at depths ranging between 9 ft and 18 ft bgs. Competent bedrock consisting of biotite gneiss rock was intercepted at variable depths between 10 ft bgs and 20 ft bgs in the northern and northeastern portions of the Site and between 20 ft bgs and 29 ft bgs in the northeastern and central portions.
6. Soil investigation results:
    - Residual soil contamination with BTEX (benzene, ethyl benzene, toluene and xylenes) at a maximum concentration of 1,309 mg/kg and MTBE at a maximum concentration of 170 mg/kg, which exceed the Unrestricted Use Soil Cleanup Objectives (UUSCOs), Restricted Soil Cleanup Objectives for Restricted Residential (RRSCOs), and the Protection of Groundwater Soil Cleanup Objectives (PGWSCOs), was presumed to have been present despite the excavation and disposal of 550.07 tons of contaminated soil at the depth of 8 ft bgs within the former gasoline tank field in the eastern portion of the Site.
    - Two gasoline VOCs including 1,2,4-trimethylbenzene (28 mg/kg) and total xylenes (3.17 mg/kg) were detected in one individual deep grab soil sample (TP-1) collected to the southwest of the former USTs excavation at the depth of soil and groundwater interface at 18 ft bgs at concentrations exceeding UUSCOs and PGWSCOs but below their respective RRSCOs with a reported evidence of petroleum staining and organic vapor concentrations of 1,200 ppm detected with the PID.

- In one shallow sample (SP-6) collected between zero and 2 ft from the northeastern portion of the Site, SVOCs including benzo(a)anthracene (7.16 mg/kg), benzo(g,i)perylene (5.84 mg/kg), benzo(k)fluoranthene (2.65 mg/kg) and chrysene (6.83 mg/kg) were detected at concentrations exceeding UUSCOs, PWGSCOs and RRSCOs while the concentrations of SVOCs including benzo(a)pyrene (6.45 mg/kg), dibenzo(a,h)anthracene (0.93 mg/kg) and indeno(1,2,3-cd) pyrene (4.13 mg/kg) exceed their respective UUSCOs and RRSCOs but below their respective PGWSCOs.
- Metals including barium (max. 542 mg/kg), chromium, hexavalent (max. 214 mg/kg), chromium, trivalent (max. 178 mg/kg), copper (max. 92.3 mg/kg), lead (max. 279 mg/kg), mercury (0.22 mg/kg), nickel (max. 100 mg/kg) and zinc (max. 346 mg/kg) were detected individually or collectively in all the shallow samples between zero and 2 ft bgs and/or between 2 and 4 ft bgs except from SP-1, SP-3 and SP-7 and all the deep samples except from SP-4 between 10 and 12 ft bgs, SP-9 between 12 and 14 ft bgs, SP-14 between 16 and 18 ft bgs, SP-15 between 7 and 9 ft bgs, SP-16 between 8 and 10 ft bgs and SP-17 between 12 and 14 ft bgs at concentration exceeding their respective UUSCOs. The concentration of chromium, trivalent in SP-6 between 2 and 4 ft bgs and barium in SP-10 between 5 and 7 ft bgs also exceeded their respective RRSCOs.
- No pesticides, PCBs or herbicides were detected in any sample exceeding their respective regulatory standards.
- One PFAS compound, perfluorooctanoic acid (PFOA), was detected in SP-15 between zero and 2 ft bgs at 0.0007 mg/kg exceeding its respective Soil Guidance Value for Unrestricted Use.

7. Groundwater investigation results:
    - Gasoline VOCs including 1,2,4-trimethylbenzene (max. 246 ug/L), 1,3,5-trimethylbenzene (66.8 ug/L), ethyl benzene (68.4 ug/L), isopropylbenzene (66.5 ug/L), n-butylbenzene (34.8 ug/L), n-propylbenzene (max. 170 ug/L), p-&m-xylene (96 ug/L), sec-butylbenzene (23.8 ug/L), and toluene (5.85 ug/L) were detected individually or collectively in the southern portion of the Site in MW-4a,

MW-7 and MW-9 at concentrations exceeding their respective AWQS-TOGS 1.1.1.

- Chlorinated VOCs (CVOCs) including cis-1,2-dichloroethylene (max. 19.4 ug/L), tetrachloroethylene (PCE) (max. 70.60 ug/L), and trichloroethylene (TCE) (max. 46.50 ug/L) were detected individually or collectively in MW-2a, MW-8, MW-10, MW-11 and MW-12 located in the northern portion of the Site, and in MW-1a and MW-7 located along the southern and southwestern boundaries of the Site at concentrations exceeding their respective AWQS-TOGS 1.1.1.
- One SVOC, naphthalene, was detected in MW-4a at 13.3 ug/L exceeding its respective AWQS-TOGS 1.1.1.
- No pesticides, herbicides or PCBs were detected in any samples.
- Total metals including manganese (max. 1,730 ug/L) in MW-2a through MW-5a and MW-7, mercury (0.8 ug/L) in MW-7 and sodium (max. 121,000 ug/L) in MW-2a through MW-5a and MW-7 through MW-9 were detected at concentrations exceeding their respective AWQS-TOGS 1.1.1. Dissolved metals including manganese (max. 1,740 ug/L) in MW-2a through MW-4a and MW-7 and sodium (max. 94,200 ug/L) in MW-2a through MW-5a and MW-7 through MW-9 at concentrations exceeding their respective AWQS-TOGS 1.1.1.
- 1,4-Dioxane was detected in MW-3a and MW-5a at a maximum concentration of 0.416 ug/L exceeding its respective AWQS-TOGS 1.1.1.
- Perfluorooctanesulfonic acid (PFOS) (max. 0.0401 ug/L) and PFOA (max. 0.034 ug/L) were detected in all samples at concentrations exceeding their respective AWQS – PFOA/PFOS.

8. Soil vapor investigation results:
    - Soil vapors consisting of gasoline range VOCs and chlorinated VOCs were detected at low to moderate levels between 5 and 17 ft bgs across the Site. The highest soil vapor concentrations consisted of PCE detected at 1,100 ug/m^3 in SV-2A from southwestern portion, and 2,2,4-trimethylpentane at 5,100 ug/m^3, o-xylene at 1,200 ug/m^3 and p-&m-xylene at 2,400 ug/m^3 detected in SV-4R-D from mid-eastern portion of the Site.

QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

A Qualitative Human Health Exposure Assessment (QHHEA) was included in the RIR. The Site currently consists of a vacant lot surrounded by a construction plywood fence with two one-story vacant buildings in the northwestern and central portions and a gasoline dispenser canopy in the southern portion. The plywood construction fence is maintained in compliance with NYCDOB rules and regulations. The Site is covered by asphalt pavement with some areas consisting of gravel as a result of backfilling activities related to former underground petroleum tanks in the eastern portion. The area surrounding the Site is zoned as an urban medium-density residential and commercial district and is anticipated to remain as such. Under current Site conditions, human exposure to contaminants in Site soils may occur through direct contact or airborne transport. Construction and remedial workers are expected to be exposed to surface and subsurface soil and groundwater. Their greatest exposure to contaminated materials will be during ongoing installations for the support of excavation (SOEs), soil excavation and potential dewatering activities. Therefore, all these remedial activities will be subject to strict health and safety and air monitoring procedures.

Based on the RI data and the proposed remedial development scenario, this Site remediation was evaluated under three different alternatives, i.e., Track 1 alternative for Unrestricted SCOs provided in Table 1, Track 2 alternative for Restricted Residential/Protection of Groundwater SCOs provided in Table 2, and Track 4 alternative for RRSCOs provided in Table 3. Track 4 RRSCO cleanup was deemed the most feasible remedial alternative for this Site. Upon completion of the remediation and redevelopment, there will be no future human exposures to contaminated soils at the Site. When completed, the Site will be developed with a 12-story mixed-use building with a partial basement and a rear yard. The partial basement will consist of bicycle parking, laundry room and mechanical spaces. The first floor will consist of 2,500 square ft of commercial space. A total of 140 affordable residential units will occupy the 1st floor to 12th floor. The top of the partial basement slab will be approximately 11 ft below grade surface (bgs). The undeveloped portion of the Site to the north of the building will be capped with 6-inch concrete slab and will be utilized as open rear year.

According to the building foundations design, the partial basement is set back approximately 9 feet from the building footprint along the property boundary with the west-adjacent building, approximately 13 feet from the building footprint along the property boundary with the east-adjacent building, and approximately 34 ft from the northwestern footprint of the building. During construction, most of the Site perimeter will be excavated for the layout of this new development. This Site construction will require excavation to the depths of 13-16 ft bgs for the partial basement slab and foundations, to the depth of 7 ft bgs for the on-grade slab and foundations in the northwestern portion of the building, to the depth of 23 ft for the elevator pit, to the depth of 2 ft bgs in the rear open area, and to the depths of 7 ft and 10 ft in the setback portions of the partial basement from the eastern and western boundaries of the Site, respectively. The excavation for the partial basement foundations will be performed at 45-degree slopes from surrounding excavations to the west, east and north. As part of the proposed Site remediation to Track 4 cleanup, two hotspots will also be excavated during this development. One hotspot will be excavated to a depth of 4 ft bgs in the northern portion of the Site at the location of the RI soil borings SP-6 and SP-10 to remove individual SVOCs and metals identified as barium and chromium trivalent, which exceeded RRSCOs to a depth of approximately 7 ft bgs. The second hotspot will be excavated to 14 ft bgs in the central portion of the partial basement at the location of the RI soil boring TP-1 to remove individual VOCs identified as xylenes and 1,2,4 trimethylbenzene, which exceeded RRSCOs and PGWSCOs at a depth of approximately 18 ft bgs. If feasible, these two hotspot excavations might be over excavated below the depth of RI exceedances with the intent of upgrading the Track 4 remedy to Track 2 cleanup. The excavation for the partial basement will not extend to the groundwater table; however, the groundwater might be encountered during the excavation for the elevator pit, which may require dewatering during this excavation. If required, dewatering will occur in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-Site disposal at a licensed or permitted disposal facility pursuant to a Contained-In determination Letter issued by NYSDEC or it would be treated under a permit from New York City Department of Environmental Protection (NYCDEP) and potentially a State Pollutant Discharge Elimination System (SPDES) permit issued by NYSDEC to meet pretreatment requirements prior to discharge to the storm sewer system. Depending on the

withdrawal amount, a Long Island Well Permit will also need to be approved and issued by NYSDEC before any dewatering activities.

Additionally, the groundwater beneath the Site will be subject to in-situ remediation through injections of bioremediation agents. Soil vapor intrusion into the new building from residual levels of gasoline VOCs remaining in groundwater beneath the Site and also from chlorinated VOCs from off-Site sources will be prevented by the installation of a sub-slab depressurization system below the basement/first floor foundation and installation of a vapor barrier system beneath the new building as a green remedy measure. Therefore, potential exposure pathways are considered incomplete for future conditions. As such, potential exposures would only occur during Site remediation and construction but not under future use scenarios, thus not impacting the public or future occupants of the Site.

The primary human health concern associated with groundwater contamination is the use of groundwater as a potable water supply. No significant human exposure to contaminated groundwater from the Site is occurring at present nor will it occur in the future because the area is served by a public water supply.

Incidental exposure to contaminants in groundwater beneath the Site may occur during excavation and construction activities, However, such potential exposure will be prevented since the Site will be subject to strict health and safety and air monitoring procedures detailed in the Site-specific Construction Health and Safety Plan (CHASP) and the Community Air Monitoring Plan (CAMP).

Construction workers could be exposed to airborne contamination (volatile organics or fugitive dust) and contaminated groundwater during construction activities. To protect construction workers from contact, ingestion and inhalation of dust or volatiles, dust monitoring dust suppression measures and exposure-by-contact prevention measures will be implemented based on the procedures outlined in the Site CHASP.

Under future conditions, there will be no potential exposures via transport of fugitive dust or vapors in ambient air because the Site will be covered by a building, pavement or clean fill.

All individuals visiting the Site could also be exposed to vapors or fugitive dust released during construction activities. However, their exposures would be occasional (during a visit) and

for relatively short periods of time (e.g., one to two hours) so that the overall exposures would be less than the exposures to construction workers and nearby residents.

Nearby residents (i.e., those living along adjoining sides of the site) may also be exposed to either volatile or dust emissions during the construction activities via the inhalation exposure route. As such, continuous air monitoring will be conducted during construction according to the CAMP procedures outlined in this RAWP. Measures to suppress either volatile or dust emissions will be also implemented based on the air monitoring data.

The NYSDEC and NYSDOH have determined the Site does not pose a significant threat to human health and the environment.

FISH AND WILDLIFE ASSESSMENT (FWIA)

The Site does not support any wildlife or natural waterway systems. Based on the requirements stipulated in Section 3.10 -Appendix 3C of DER-10, there was no need to prepare an FWRIA for The Site.

SUMMARY OF THE REMEDY

A Track 4 cleanup is proposed for this Site. This Site remedy might be upgraded to a Track 2 cleanup if Track 2 conditions are met following Site remediation.

Selected Track 4 cleanup consists of the following remedial components

1. A remedial program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:
    - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
    - Reducing direct and indirect greenhouse gases and other emissions;

- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this Site, any future on-Site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

As part of the remedial program, to evaluate the remedy with respect to green and sustainable remediation principles, an environmental footprint analysis will be completed. The environmental footprint analysis will be completed using an accepted environmental footprint analysis calculator such as SEFA (Spreadsheets for Environmental Footprint Analysis, USEPA). Water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste reduction and material use will be estimated, and goals for the project related to these green and sustainable remediation metrics, as well as for minimizing community impacts, protecting habitats and natural and cultural resources, and promoting environmental justice, will be incorporated into the remedial program, as appropriate. The project will include detailed requirements to achieve the green and sustainable remediation goals. Further, progress with respect to green and sustainable remediation metrics will be tracked during implementation of the remedial action and reported in the Final Engineering Report (FER), including a comparison to the goals established during the remedial program.

Additionally, the remedial program will include a climate change vulnerability assessment, to evaluate the impact of climate change on the project Site and the proposed remedy. Potential vulnerabilities associated with extreme weather events (e.g., hurricanes,

lightning, heat stress and drought), flooding, and sea level rise will be identified, and the remedial program will incorporate measures to minimize the impact of climate change on potential identified vulnerabilities.

Climate change is not expected to have a significant impact on the remedial system.

2. Excavation of soil/fill exceeding Track 4: Restricted-Residential cleanup across the entire of Site. The intended SCOs for this Site are listed in Table 3. This cleanup will require excavation of two hotspots to the depth of 2 feet beneath the future cover on-Site as follows:
    - Excavation to 4 ft bgs in the vicinity of RI soil borings SP-6 and SP- 10 to remove the barium and chromium trivalent, which exceeded RRSCOs to the depth of 7 ft bgs in the proposed area of the rear yard; and,
    - Excavation to 14 ft bgs in the vicinity of RI soil borings TP-1 to remove the xylenes and 1,2,4 trimethylbenzene, which exceeded RRSCOs and PGWSCOs at the depth of 18 ft bgs in the central portion of the proposed partial basement.
3. Development and implementation of a Construction Health & Safety Plan (CHASP) and Community Air Monitoring Plan (CAMP) for the protection of on-Site workers, community/residents, and the environment during remediation and construction activities;
4. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
5. Decommissioning of on-Site monitoring wells in accordance with NYSDEC CP-43 Policy;
6. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of Track 4 SCOs
7. If encountered, excavation and removal of any underground storage tanks (USTs), underground piping or other structures associated with a source of contamination will be disposed of off-Site. Soil screening will be conducted throughout the excavation phase for indications of contamination (by visual means, odor, and monitoring with PID).

8. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal. Waste disposal facilities will be selected based on the data collected to date and a waste classification sampling. Approximately 5,600 cubic yards (est. 8,400 tons) of soil/fill will be excavated and removed for disposal during Site development;

9. Import of materials to be used for backfilling and cover in compliance with: (1) chemical limits included in Table 2, (2) all Federal, State and local rules and regulations for handling and transport of material;

10. Construction and maintenance of a Site cover consisting of both a 6-inch-thick concrete slab on-grade and a 12-inch-thick concrete basement slab underlain by compacted bluestone and 6-inch-thick concrete slab in open year yard to prevent human exposure to residual contaminated soil/fill remaining under the Site;

11. Installation of an active sub-slab depressurization system (SSDS) to mitigate the potential soil vapor intrusion from residual gasoline VOCs in groundwater and off-Site chlorinated VOCs into the new building. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.
12. Following remedial actions and prior to occupancy, an SSDS Efficacy Sampling Work Plan will be submitted to NYSDEC for approval. This work plan will involve indoor air sampling in the partial basement and the first floor of the building to verify that no volatilization of on-Site or off-Site contaminants would impact the indoor air quality of the new building at the Site.

13. Recording of an Environmental Easement, including Institutional Controls, to prevent future exposure to any residual contamination remaining at the Site.

14. Publication of a Site Management Plan for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting;

15. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations.

With the intent of upgrading the Track 4 remedy to a Track 2 cleanup, the two soil hotspots may be over excavated during Site remediation to remove contaminants below the depth of their RI exceedance in order meet the Track 2 standards for RRSCOs and PGWSCOs listed in Table 2. The attainment of a Track 2 cleanup will be confirmed by the collection and analysis of end-point samples. Under a Track 2 cleanup, the same remedial components of the Track 4 cleanup listed above will be applied except for the need of a composite cover system as EC.

REMEDIAL ACTION WORK PLAN

1.0 INTRODUCTION

6014 BCD Realty, LLC entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) in June 2025, to investigate and remediate a 0.34-acre property located at 3083 Webster Avenue in Bronx, New York. 6014 BCD Realty, LLC is a Volunteer in the Brownfield Cleanup Program. Restricted Residential use is proposed for the property. When completed, the Site will contain 12-story mixed residential and commercial use building with a partial basement and a rear yar. Refer to the Brownfield Cleanup Program (BCP) application for additional details.

This Remedial Action Work Plan (RAWP) summarizes the nature and extent of contamination as determined from data gathered during the Remedial Investigation (RI), performed between 2009 and 2026. It provides an evaluation of a Track 1 cleanup and other applicable Remedial Action alternatives, their associated costs, and the recommended and preferred remedy. The remedy described in this document is consistent with the procedures defined in DER-10, DER-31, and complies with all applicable standards, criteria and guidance. The remedy described in this document also complies with all applicable Federal, State and local laws, regulations and requirements. The NYSDEC and New York State Department of Health (NYSDOH) have determined this Site does not pose a significant threat to human health and the environment. The RI for this Site did not identify fish and wildlife resources.

A formal Remedial Design document will not be prepared.

1.1 Site Location and Description

The Site is located in the Bronx County, New York and is identified as Block 3331 and Lot 57 on the New York City Tax Map. A United States Geological Survey (USGS) topographical quadrangle map (Figure 1) shows the Site location. The Site is situated on an approximately 0.34-acre area bounded by multiple 2 to 5-story residential buildings to the north, west and east and by Webster Avenue to the south followed by a 1-story autobody repair facility, an 11-story

residential building, and two day-care facilities (see Figure 2). A boundary map is attached to the BCA as required by Environmental Conservation Law (ECL) Title 14 Section 27-1419. The 0.34-acre property is fully described in Appendix A – Metes and Bounds. A global positioning system coordinates for the starting point is included.

1.2 Contemplated Redevelopment Plan

The Remedial Action to be performed under the RAWP is intended to make the Site protective of human health and the environment consistent with the contemplated end use. The proposed redevelopment plan and end use are described here to provide the basis for this assessment. However, the Remedial Action contemplated under this RAWP may be implemented independent of the proposed redevelopment plan.

The proposed development consists of a 12-story mixed residential and commercial building with a partial basement. The building footprint is approximately 9,037.44 square ft and the partial basement is approximately 6,436.36 square ft. The partial basement will consist of bicycle parking, laundry room and mechanical spaces. The first floor will consist of 2,500 square ft of commercial space. A total of 140 affordable residential units will occupy the 1st floor to 12th floor. The remaining undeveloped portion of the Site will consist of a rear open space. A copy of the proposed development plan is included as Figure 3 (3A, 3B).

According to the building foundations design, the partial basement is set back approximately 9 feet from the building footprint along the property boundary with the west-adjacent building, approximately 13 feet from the building footprint along the property boundary with the east-adjacent building, and approximately 34 ft from the northwestern footprint of the building. During construction, most of the Site perimeter will be excavated for the layout of this new development. This Site construction will require excavation to the depths of 13-16 ft bgs for the partial basement slab and foundations, to the depth of 7 ft bgs for the on-grade slab and foundations in the northwestern portion of the building, to the depth of 23 ft for the elevator pit, to the depth of 2 ft bgs in the rear open area, and to the depths of 7 ft and 10 ft in the setback portions of the partial basement from the eastern and western boundaries of the Site, respectively. The excavation for the partial basement foundations will be performed at 45-degree

slopes from surrounding excavations to the west, east and north. Figure 4 provides a map of proposed Site excavation for construction.

1.3 Description of Surrounding Property

The Site is located along Webster Avenue to the south and southeast, East 204th Street to the northwest and East Mosholu Parkway North to the southwest in a medium-density residential zoning and commercial district in the borough of the Bronx, New York. Surrounding properties within a half mile (2,650 feet) radius of the Site consists of residential, commercial, and vacant lands (see Figure 5). The following sensitive receptors are located within a half-mile radius of the Site:

- Daycare: Wandaful Family Group Daycare LLC; Brightstar Daycare; Ediannet Day Care Corp.; Pick A Boo Daycare Corp.; Dm Group Family Daycare and, Little Sunshine Playhouse Group Family Daycare INC.
- Schools: P.S. 168; P.S./M.S. 20; Bedford Park Elementary School; Bronx School for Continuous Learning, Bronx Community Charter School; P.S. 008, P.S. 56 Norwood Heights, Academy of Mount Saint Ursula, P.S./I.S. 54, Bronx School for Music, Success Academy Charter School, Girls Prep Bronx Charter School II, Speech Athletes, Center for Continuing Professional Development, Hispanic Culture Arts
- Health Care: Perry Avenue Family Medical, Montefiore Prevention Center
- Community Centers: Cardinal McCloskey Community Services, Moshulu Montefiore Community Center
- Parks: Mosholu parkway, Williamsbridge Oval, Brown River Forest Park, Whalen Playground, Frank Frisch Field, French Charley's Playground
- Rivers/Streams: Bronx River

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The Site was investigated under the Brownfield Cleanup Program, in accordance with the scope of work presented in the NYSDEC-approved Remedial Investigation (RI) Work Plan dated March 2025, RIWP Addendum dated July 2025 and Supplemental RIWP dated December 2025. The investigation was conducted between July 15, 2025, and January 14, 2026. The RI was submitted and approved by NYSDEC on May 21, 2026. Prior to this, an RI was also conducted in August 2024 in accordance with OER-approved RIWP dated July 2024. Also, prior environmental investigations were conducted at the Site and included tanks closure activities in 1998 and 2021 by Tyree and LaBella, respectively, and a Phase II Investigation conducted by AEC in December 2021. Overall findings of these on-Site investigations were summarized in the March 2026 RIR.

The general sampling scope for each investigation is summarized as follows:

Tank Closure under PBS #2-325953 by Tyree in 1998

- Collection of nine (9) confirmatory end-point soil samples (Sample 1 through Sample 9) included six (6) sidewall samples at 5 ft below ground surface (bgs), and one (1) bottom sample at 8 ft bgs beneath the two 4,000-gallon gasoline USTs, and two (2) bottom samples at 7 ft bgs beneath the six 550-gallon gasoline USTs.
- Collection of one (1) composite bottom end-point sample (Sample 1) from the tank pit for 550-gallon waste oil UST.
- No end-point samples were collected from the tank pit of the fuel oil tank.
- All the collected soil samples were analyzed for VOCs via EPA Method 8021 and methyl tert-butyl ether (MTBE). The waste composite sample was also analyzed for RCRA metals.

Subsurface Investigation by Tyree between 1998 and 2009 in response to NYSDEC's Correspondence for Spill #9711128 (closed on June 5, 2012) dated August 12, 1998)

- Installation of five (5) groundwater monitoring wells designated as MW-1 through MW-5 in the four corners and the center of the Site in 1998 and collection of twenty (20) groundwater samples in four rounds of quarterly sampling between May 2002 and November 2009 to determine the groundwater flow direction and to evaluate the groundwater quality underneath the Site.
- Performance of two (2) rounds of Enhanced Fluid Recovery (EFR) events in MW-4 in southern corner of the Site in 2000 and 2001.
- Installation of six (6) soil probes (designated as SB-1 through SB-6) including one in the mid-northern portion and five in the southern portion of the Site and collection of six (6) soil samples to evaluate soil quality. The samples from these soil probes were collected variable depths intervals ranging between 10-13 ft bgs to 25-27 ft bgs.
- Conversion of two (2) soil probes (SB-2 and SB-3) in the southeastern portion of the Site into temporary monitoring wells and collection of two (2) groundwater samples to evaluate groundwater quality.
- The soil samples were analyzed for VOCs via EPA Method SW8260C (STARS/CP-51 list). Soil samples were also analyzed for SVOCs via EPA Method SW8270D (STARS/CP-51 list).

Tank Closure under PBS #2-325953 in August 2021 and Limited Remedial Excavation for Spill #2105015 (closed on February 16, 2022) in September 2021 by LaBella

- Collection of eleven (11) end-point samples following removal of two (2) 4,000-gallon gasoline USTs and related two (2) gasoline dispensers and distribution pipelines located in the southern portion of the Site including four (4) shallow sidewall samples (PE-1 through PE-4) at 5-6 ft and 7-8 ft bgs, four (4) deep sidewall samples (LB-1 through LB-4) at the base of the tank pad at 11-12 ft bgs, two (2) dispenser end-point samples (Disp-1 and Disp-2) at 2-3 ft bgs and 3-4 ft bgs and one (1) product line end-point (PL-1) at 2-3 f bgs.

- Collection of three (3) end-point samples (PE-5 through PE-7) following further soil excavation underneath the product line at 3-5 ft bgs.
- Collection of one (1) soil sample (TP-1) from a test pit installed down to 18 ft bgs in-between the tank pit and the dispenser island in the southeastern portion of the Site.
- Collection of one (1) groundwater sample (GW-1) by advancing the test pit down to 20 ft bgs.
- The soil and groundwater samples were analyzed for VOCs and SVOCs (CP-51 list).

Phase II Sub-Surface Investigation in December 2021 by AEC

- Installation of six (6) soil probes (B-1 through B-6) across the Site and collected six (6) soil samples between 9 and 20 ft bgs to evaluate the soil quality. The soil samples were analyzed for VOCs and SVOCs (CP-51 list).

Remedial Investigation in August 2024 by HydroTech

This investigation was performed in accordance with NYCOER-approved RI work plan addressing the E-249 designation for hazardous material assigned to this Site:

- Performance of a geophysical survey to identify any USTs' anomalies;
- Installation of eight (8) soil probes to depths that corresponded to the proposed excavation for the layout of a new building foundations including six soil probes designated as SP-2 to SP-7 installed to the depth of 12 ft bgs and one soil probe designated SP-8 installed to the depth of 18 ft bgs. Two soil probes designated as SP-1 and SP-6 were installed outside the proposed building footprint to the depth of 4 ft bgs. Sixteen soil samples were collected including eight shallow samples from 0-2 ft bgs, one sample from each 2-4 ft bgs and 16-18 ft bgs and five samples from 10-12 ft bgs. All samples were analyzed for VOCs via EPA 8260B, SVOCs via EPA 8270D, pesticides via EPA Method 8081B, PCBs via EPA Method 8082A and metals (including hexavalent and trivalent chromium) via EPA Method 6010C, EPA Method 7471 and EPA Method 7196A. Four soil samples obtained from SP-4 and SP-8 at 0-2 ft bgs and 10-12 ft bgs were analyzed for per- and polyfluoroalkyl substances (PFAS) via EPA Method 1633.

- Installation of four (4) temporary groundwater monitoring wells to the depth of Geoprobe refusal. All four monitoring wells were determined to be dry, and no groundwater samples were collected.
- Installation of five (5) soil vapor points (SV-1 to SV-5) within the footprint of the proposed development. Two of these soil vapor probes, SV-2 and SV-4, were nested and were identified as SV-2A, SB-2B and SV-4A, SV-4B. A total of seven soil vapor samples were collected including five samples obtained from SV-1, SV-2A, SV-3, SV-4A and SV-5 at 12 ft bgs and two samples were collected from SV-2B and SV-4B at 6 ft bgs and were analyzed for VOCs via EPA Method TO-15.

Remedial Investigation in July/August 2025 and December2025/January 2026 by HydroTech

This investigation was performed under the Brownfield Cleanup Program in accordance with NYSDEC-approved RIWP dated March 4, 2025, RIWP Addendum dated July 18, 2025, and Supplemental RIWP dated December 04, 2025:

- Installation of twelve (12) soil probes (SP-9 through SP-20) to 26 to 46 ft bgs across the Site. Specifically, SP-9 was installed at the western corner of the Site in the vicinity of previous soil probe SP-2, SP-10 and SP-18 at the northern corner in the vicinity of previous soil probe SP-6, SP-11 at the eastern corner, SP-12 at the southern corner, SP-13 in the central portion of the Site in the vicinity of previous soil probe SP-4, SP-14 in the southeastern portion in the vicinity of previous soil probe SP-7, SP-15 in the southwestern portion in the vicinity of previous soil vapor points SV-2A and SV-2B, SP-16 and SP-18 in the northwestern portion, and SP-17 and SP-20 at the location of the former auto repair shop in the central portion of the Site. Collection of fourteen (14) soil samples from the installed soil probes including five (5) samples from the shallow layer between zero and 2 ft bgs and nine (9) samples from the two-foot interval above the boulder refusal ranging from 5-7 ft bgs to 16-18 ft bgs.
- Installation of twelve (12) monitoring wells (MW-1a to MW-5a and MW-6 to MW-12) across the Site, of which four wells consisted of bedrock wells with a 4-inch steel casing

was driven through the overburden formation to approximately 2 ft into the competent rock at MW-2a and to 5 ft into the bedrock at MW-10 to MW-12, and collection of twelve (12) groundwater samples from the installed monitoring wells.

- Installation of seven (7) soil vapor probes (SV-1R – SV-5R, SV-6 and SV-7) at the original locations of SV-1 through SV-5 during August 2024 RI and central portion and northwestern portion of the Site. Collection of thirteen (13) soil vapor samples including two samples from each soil vapor probes including SV-1R, SV-2R, SV-4R, SV-5R and SV-7, one sample from each soil vapor probe at SV-3R and SV-6 and one duplicate sample from SV-7. The vapor samples were analyzed for VOCs via EPA Method TO-15.
- Performance of a borehole geophysical logging at the borings locations of SP-18/MW-11, SP-19/MW-11 and SP-20/MW-12 to study the influence of hydrogeological features of the underlying bedrock on the water flow beneath the Site and to delineate the CVOCs contaminants detected in MW-2a.

2.1 Summary Remedial Investigations Performed

The February 2026 RIR provided a summary of all investigations performed at the Site, which were considered in the development of remedy described in this RAWP.

Table 4 provides the soil samples analytical results. Table 5 provides the groundwater samples analytical results . Table 6 provides soil vapor samples analytical results. Appendix B provides a summary of the number, location, sampling intervals and sampling criteria of the collected soil, groundwater and soil vapor samples. Figure 6 provides a map showing all the boring/sample locations.

A summary of work completed during these investigations is provided below:

2.1.1 Borings and Wells

1. Installed a total of thirty-two (32) soil probes down to 4 ft bgs and to max. of 34 ft bgs and twenty-four (24) sampling points at a depth of 4 ft bgs and a max. of 27 ft bgs across the Site.

2. Installed a total of twelve (12) groundwater monitoring wells down to 26 ft bgs and to max. of 46 ft bgs including three bedrock wells, and three (3) groundwater probes down to 16.5 ft bgs and to max. of 27 ft bgs across the Site.
3. Installed a total of fourteen (14) soil vapor probes down to 6 ft bgs and to max. of 17 ft bgs across the Site.

2.1.2 Samples Collected

1. Collected a total of sixty-nine (69) soil samples for chemical analysis to evaluate soil quality.
2. Collected a total of fifteen (15) groundwater samples for chemical analysis to evaluate groundwater quality.
3. Collected a total of fourteen (14) soil vapor samples for chemical analysis to evaluate soil vapor quality.

2.1.3 Chemical Analytical Work Performed

The chemical analyses conducted on the soil, groundwater and soil vapor samples collected at the Site are summarized below:

Soil Samples:

- 10 samples were analyzed for TCL VOCs via EPA method 8021 + MTBE;
- 1 sample analyzed for RCRA metals via EPA method 6010 & EPA method 7471 for Mercury;
- 56 samples were analyzed for TCL VOCs via EPA method 8260 and TCL SVOCs via EPA method 8270;
- 30 samples were analyzed for pesticides via EPA method 8081, PCBs via EPA method 8082, TAL metals via EPA method 6010 & EPA method 7471 for mercury, and per-and polyfluoroalkyl substances (PFAS) via EPA method 1633;
- 14 samples were analyzed for herbicides via EPA method 8151, and 1,4-dioxane via method 8270 SIM.

Groundwater Samples:

- 15 samples were analyzed for TCL VOCs via EPA method 8260;
- 12 samples were TCL SVOCs via EPA method 8270;
- 9 samples were analyzed for pesticides via EPA method 8081, herbicides via EPA method 8151, polychlorinated biphenyls via EPA method 8082, TAL metals via EPA method 6010 & EPA method 7471 for mercury, 1,4-dioxane via method 8270 SIM, per- and polyfluoroalkyl substances (PFAS) via EPA method 1633.

Soil Vapor Samples

- 14 samples were analyzed for VOCs via EPA Method TO-15

Appendix B provides a summary of the number, location, sampling intervals and sampling criteria of the collected soil, groundwater and soil vapor samples.

2.1.4 Geophysical Work

No anomalies indicative of suspect USTs were identified during geophysical survey at the Site. All the USTs and their related piping systems were removed from the Site in 1998 and 2021.

2.1.5 Best Management Practices

Best management practices and techniques were employed during the implementation of the RI fieldwork in 2024, 2025 and 2026 in compliance with DER-31 policy and guidance. The following were considered during the RI:

1. Limit the use and idling of generators and vehicles to reduce emissions.
2. Minimize truck travel for disposal of IDW waste disposal.
3. Manage on-Site resources and materials efficiently.
4. Use local subcontractors to minimize vehicle emissions during commute.

5. Request that subcontractors use clean diesel equipment to reduce emissions.
6. Reduce the use of water used for decontamination of equipment.
7. Request project staff and subcontractors to use public transportation to the extent practicable.

2.2 Significant Threat

The Site was determined not to be a significant threat to human health and the environment.

2.3 Site History

A Site history was established based upon the review of the following environmental assessments previously performed at the Site:

- Phase I Environmental Site Assessment (ESA) report prepared by CA Rich Geology Services, D.P.C. (ca rich) on December 27, 2023.

CA RICH indicated the Site was developed during 1896 with a three-story building until 1900. In 1927 it was listed as auto supplies and from 1940 to 2021 the Property was listed as an auto repair and/or service station. CA RICH also identified two 240-gallon aboveground storage tanks (ASTs) containing fuel oil and waste soil that were listed as being in service under the PBS registration number 2-325953. The two ASTs were observed by CA RICH along two inactive underground hydraulic lifts inside the vacant auto repair shop with an adjoining convenience store in the central portion of the Site. These two ASTs were closed and removed by 6014 BCD Realty LLC (Volunteer) prior to the June 2025 BCA. CA RICH also listed several NYSDEC spill numbers associated with the Site, and that were all closed to the satisfaction of NYSDEC. These spill were issued for tank test failure in 2002 (Spill number 9106593), for minor petroleum and antifreeze spills on concrete in 2004, 2005, 2006, 2007 and 2023 (Spill numbers 0402479, 0505304, 0513516, 0514557, 0613953, 0604640, 0703246, 0612394, 0612429, 0602646, 0905693,) for tanks overfill in 2005 (Spill number 0504396) and for encountering contaminated soil during tanks closure and removal activities in 1998 (Spill number 9711128) and in 2021

(Spill number 2105015).

2.4 Geologic and Hydrogeologic Conditions

1. Elevation of the property is approximately 86 ft above mean sea level. The Site topography is uneven, and it declines from the north to the south by an average of 4 ft; from NAVD88 elevation (el.) between 88.78 ft el. in the northern portion to elevation ranging between 90.47 ft el. to 85.39 ft el. to 85.79 ft el. in the southern portion. The ground level at the Site also declines from the west to east by an average of 1.69 ft; from elevation ranging between 88.78 ft el. to 90.47 ft el. in the western portion to elevation ranging between 85.39 ft el. to 85.79 ft el. in the eastern portion.
2. The stratigraphy beneath the Site consists of fine to coarse grained silty sand with pebbles and rocks. Evidence of fill material consisting of concrete, asphalt, bricks, and charcoal was identified in soil probes between zero to 4 ft bgs. Overburden formation of weathered rock consisting of poorly grained sand was encountered at depths ranging between 9 ft and 18 ft bgs. Competent bedrock consisting of biotite gneiss rock was intercepted at variable depths between 10 ft bgs and 20 ft bgs in the northern and northeastern portions of the Site and between 20 ft bgs and 29 ft bgs in the northeastern and central portions.
3. Depth to groundwater beneath the Site was measured across three distinct intervals and it ranges between 22.33 ft and 26.17 ft in overburden material/weathered bedrock, between 16.23 ft and 24.7 ft in weathered bedrock/competent bedrock, and between 13.44 ft and 24.14 ft in competent bedrock. The decreased water level in the bedrock wells appears to be influenced by the static wellhead pressure from deep transmissive (water-bearing) bedrock fractures identified during a borehole geophysical logging exercise.
4. The groundwater flow direction beneath the Site is mapped separately across three distinct intervals and it was determined toward the west in the overburden material/weathered bedrock, toward the southwest in weathered bedrock/competent bedrock, and toward the northwest in the competent bedrock.

Groundwater flow contours maps in the overburden material/weathered bedrock, in weathered bedrock/competent bedrock, and in the competent bedrock are provided in Figure 7 (7A to 7C).

2.5 Contamination Conditions

2.5.1 Conceptual Model of Site Contamination

Based on the February 2026 RI findings, impacted materials beneath the site include the following:

2.5.1.1 Impact in Soil:

Gasoline VOCs including 1,2,4-trimethylbenzene (at 28 mg/kg), and total xylenes (at 3.17 mg/kg) exceeded UUSCOs, RRSCOs and PGWSCOs in one deep sample collected at the groundwater interface at 18 ft bgs in the eastern portion of the Site and these VOCs are residual from the former closed NYSDEC Spill #9711128. SVOCs consisting of PAHs benzo(a)anthracene (max. of 7.16 mg/kg), benzo(a)pyrene (max. of 6.45 mg/kg), benzo(b)fluoranthene (max. of 5.84 mg/kg), benzo(k)fluoranthene (max. of 2.65 mg/kg), chrysene (max. 6.83 mg/kg), and indeno(1,2,3-cd)pyrene (max. 4.13 mg/kg) and metals including chromium trivalent (max. of 214 mg/kg), and barium (max. of 542 mg/kg), exceeded UUSCOs and RRSCOs in two shallow soil between zero and 7 ft bgs in the north portion of the Site above the overburden formation of boulders/weathered bedrock. The compound PFOA (max. 0.0007 mg/kg) exceeded NYSDEC Guidance Value for Unrestricted Use in one shallow sample collected between zero and 2 ft bgs in the southern portion of the Site. Total PCBs, pesticides, and herbicides did not occur in any soil samples.

2.5.1.2 Impact in Groundwater:

Dissolved gasoline VOCs consisted of 1,2,4-trimethylbenzene (max. 246 ug/L) 1,3,5-trimethylbenzene (max. 66.8 ug/L), ethyl benzene (max. 68.4 ug/L), isopropylbenzene (max. 66.5 ug/L), n-butylbenzene (max. 34.8 ug/L), n-propylbenzenewere (max. 170 ug/L), sec-butylbenzene (max. 23.8 ug/L), and p- & m- Xylenes (max. 96 ug/L) which exceeded AWQS -

TOGS 1.1.1 in three wells in the southern portion of the Site and are considered a residual impact from the closed NYSDEC spill number 9711128. One individual SVOC naphthalene (max. 13.3 µg/L) also exceeded its AWQS - TOGS 1.1.1 in one well in the southern portion of the Site.

Chlorinated VOCs including PCE (max. 70.60 ug/L), TCE (max. 46.50 ug/L), and cis-1,2-DCE (max. 19.4 ug/L) exceeded AWQS - TOGS 1.1.1. in five wells located along the northern portion of the Site and also in two wells located along the western and southwestern boundaries. Consistent with a northwesterly groundwater flow from deep transmissive (water-bearing) bedrock fractures beneath the Site combined and the higher CVOCs concentrations detected in deep bedrock wells compared to those detected in wells screened in the shallow groundwater flow system, these chlorinated compounds are likely to have migrated horizontally through a deep fractured-rock system from two neighboring historical dry cleaners located within 200 ft to the north/northeast of the Site. Figure 5 provides the locations of surrounding drycleaners.

Dissolved metals including magnesium, and sodium were commonly detected in the groundwater beneath the Site and exceeded AWQS - TOGS 1.1.1. Emerging contaminants compounds including 1,4-dioxane (max 0.608 µg/L) exceeded AWQS - TOGS 1.1.1 in two wells located in the eastern and central portions, and PFOS (max. 0.040 µg/L) and PFOA (max. 0.034 µg/L) also exceeded AWQS for PFOA/PFOS in all wells across the Site. Pesticides, herbicides, or PCBs were not detected on any groundwater samples.

2.5.1.3 Impact in Soil Vapor:

Chlorinated VOCs including PCE, TCE, carbon tetrachloride, and chloroform were commonly detected in soil vapor at Site. PCE was the most abundant with a maximum concentration of 1,100 µg/m^3 reported beneath the southern portions.

Soil vapors are present across the Site and included 2,2,4-trimethylpentane (isooctane) (max. 5,100 µg/$m^{3)}$ and p- & m- xylenes (max. 2,400 µg/m^3), which were the most abundant around the former tank area in the eastern portion of the Site. These soil vapors are a residual impact from the closed NYSDEC spill number 9711128.

Based on the types of identified contaminants beneath the Site and the nature of historic uses reported at the Site and its surroundings, along with the evaluation of the characteristics of transmissive (water-bearing) bedrock fractures identified beneath the Site, the source of gasoline VOCs in soil, in groundwater and soil vapors at the Site is likely associated with the closed Spill closed NYSDEC spill number 9711128, which resulted from the historical gasoline filling services at the Site. The PAHs, metal and PFAS contamination in soil at the Site is likely due to both the placement of historical urban fill from unknown sources and the use of the Site as an auto repair facility. The CVOC impact in groundwater and in soil vapor at the Site is likely due to the horizontal migration of these contaminants via a fractured-rock water flow system from surrounding drycleaners located within 200 feet to the north/northeast of the Site (see Figure 5).

2.5.2 Description of Areas of Concern

The following Areas of Concerns were identified based upon the review of the historical Site records, previous investigations and field observations:

AOC-1: The historic use of the Site as auto repair and filling station.

Based upon the Site history established in the previous Phase I ESA, the Site was developed and operated as auto repair and filling station since 1940s. Underground and aboveground storage tanks for gasoline and fuel oil were observed, encountered and later removed from the Site.

AOC-2: The presence of petroleum related VOCs at the depth of soil and groundwater interface underneath the Site.

Analytical results indicate that petroleum related VOCs are present at the depth of soil and groundwater interface at 18 ft bgs in the eastern portion of the Site at concentrations exceeding their respective UUSCOs, RRSCOs and PGWSCOs that may result from the residual impact from the former closed NYSDEC Spill #9711128.

AOC-3: The presence of dissolved chlorinated VOCs including PCE, TCE and cis-1,2-DCE in groundwater underneath the Site.

Analytical results indicate that dissolved chlorinated VOCs including PCE, TCE and cis-1,2-DCE are present in groundwater at concentrations exceeding their respective AWQS - TOGS 1.1.1 across the northern, southern and southwestern boundaries of the Site and these contaminants are migrating through the deep bedrock fractures water flow system from an off-Site source.

AOC-4: The presence of SVOCs consisting of PAHs and metals including chromium trivalent and barium in soil.

Analytical results indicate that SVOCs consisting of PAHs and metals including chromium trivalent and barium were detected between zero and 7 ft bgs above boulders and weathered rock beneath the north portion of the Site at concentrations exceeding their respective UUSCOs, RRSCOs.

AOC-5: The presence of PFAS in shallow soil beneath the southern portion of the Site and in groundwater across the Site.

Analytical results indicate that PFOA are present in shallow soil beneath the southern portion of the Site at concentrations exceeding its NYSDEC Guidance Value for Unrestricted Use. In addition, PFOA and PFOS were commonly detected in groundwater beneath the at concentrations exceeding their respective AWQS-PFOA/PFOS.

AOC-6: The presence of gasoline related vapors and chlorinated vapors across the entire Site.

Analytical results indicate that chlorinated vapors of PCE with a maximum of 1,100 $\mu g/m^3$ and gasoline vapors consisting of 2,2,4-trimethylpentane (isooctane) and p- & m- xylenes at maximums of 5,100 $\mu g/m^3$ and of 2,400 $\mu g/m^3$ are present in soil vapor across the entire Site.

2.5.3 Identification of Standards, Criteria and Guidance

A summary of exceedances of all analyzed matrices during the RI is provided in Table 4, Table 5, and Table 6. Applicable SCGs for this project are provided in Table 1 for Track 1 SCOs, Table 2 for Track 2 SCOs, and Table 3 for Track 4 SCOs.

2.5.4 Soil/Fill Contamination

Soil characterization indicated soil beneath the Site consists of fine to coarse grained silty sand with pebbles and rocks. Evidence of fill material consisting of concrete, asphalt, bricks, and charcoal was identified in soil probes between zero to 4 ft bgs.

2.5.4.1 Summary of Soil/Fill Data

The analytical results for soil/fill underneath the Site are summarized as follows:

- Two gasoline VOCs including 1,2,4-trimethylbenzene (28 mg/kg) and total xylenes (3.17 mg/kg) were detected in one individual deep grab soil sample (TP-1) collected to the southwest of the former USTs excavation at the depth of soil and groundwater interface at 18 ft bgs at concentrations exceeding Unrestricted Use Soil Cleanup Objectives (UUSCOs) and Protection of Groundwater Soil Cleanup Objectives (PGWSCOs) but below their respective Restricted Soil Cleanup Objectives for Restricted Residential (RRSCOs) with a reported evidence of petroleum staining and organic vapor concentrations of 1,200 ppm detected with the PID.
- In one shallow sample (SP-6) collected between zero and 2 ft from the northeastern portion of the Site, SVOCs including benzo(a)anthracene (7.16 mg/kg), benzo(g,i)perylene (5.84 mg/kg), benzo(k)fluoranthene (2.65 mg/kg) and chrysene (6.83 mg/kg) were detected at concentrations exceeding UUSCOs, PWGSCOs and RRSCOs while the concentrations of SVOCs including benzo(a)pyrene (6.45 mg/kg), dibenzo(a,h)anthracene (0.93 mg/kg) and indeno(1,2,3-cd) pyrene (4.13 mg/kg) exceed their respective UUSCOs and RRSCOs but below their respective PGWSCOs.
- Metals including barium (max. 542 mg/kg), chromium, hexavalent (max. 214 mg/kg),

chromium, trivalent (max. 178 mg/kg), copper (max. 92.3 mg/kg), lead (max. 279 mg/kg), mercury (0.22 mg/kg), nickel (max. 100 mg/kg) and zinc (max. 346 mg/kg) were detected individually or collectively in all the shallow samples between zero and 2 ft bgs and/or between 2 and 4 ft bgs except from SP-1, SP-3 and SP-7 and all the deep samples except from SP-4 between 10 and 12 ft bgs, SP-9 between 12 and 14 ft bgs, SP-14 between 16 and 18 ft bgs, SP-15 between 7 and 9 ft bgs, SP-16 between 8 and 10 ft bgs and SP-17 between 12 and 14 ft bgs at concentration exceeding their respective UUSCOs. The concentration of chromium, trivalent in SP-6 between 2 and 4 ft bgs and barium in SP-10 between 5 and 7 ft bgs also exceeded their respective RRSCOs.

- No pesticides, PCBs or herbicides were detected in any sample exceeding their respective regulatory standards.
- One PFA compound, perfluorooctanoic acid (PFOA), was detected in SP-15 between zero and 2 ft bgs at 0.0007 mg/kg exceeding its respective Soil Guidance Value for Unrestricted Use.

For the sampling conducted during tank closure and removal in 1998 by Tyree, BTEX compounds were detected at a maximum concentration of 1,309 mg/kg and MTBE at a maximum concentration of 170 mg/kg, which exceeded UUSCOs, RRSCOs, and PGWSCOs. The locations of these samples were not specified in any of the historical reports. A total of 550.07 tons of contaminated soil was excavated and removed at the depth of 8 ft bgs within the former gasoline tank without obtaining and analyzing confirmation end-point samples. NYSDEC correspondence dated August 1998 suggested the residual presence of this contamination following tanks closure activities.

2.5.4.2 Comparison of Soil/Fill with SCGs

Figure 8 (8A to 8D) provides spider maps showing the locations and levels of contamination in exceedances of UUSCOs, RRSCOs and PGWSCOs and also the levels of PFAs in exceedance to NYSDEC Guidance Values for Unrestricted Use and Restricted Residential Use.

Based upon the analytical results, petroleum related VOCs detected at the soil/groundwater interface at concentrations exceeding UUSCOs, RRSCOs and PGWSCOs likely resulted from the residual impact from the closed NYSDEC spill number 9711128, which is associated with

the historic release from former underground storage tanks that were closed and removed between 1998 and 2021. SVOCs and metals at concentrations exceeding UUSCOs, RRSCOs and PGWSCOs were also detected down to soil/groundwater interface.

2.5.5 Groundwater Contamination

2.5.5.1 Summary of Groundwater Data

The analytical results for the 2025-2026 RI groundwater sampling are summarized as follows:

- Gasoline VOCs including 1,2,4-trimethylbenzene (max. 246 ug/L), 1,3,5-trimethylbenzene (66.8 ug/L), ethyl benzene (68.4 ug/L), isopropylbenzene (66.5 ug/L), n-butylbenzene (34.8 ug/L), n-propylbenzene (max. 170 ug/L), p-&m-xylene (96 ug/L), sec-butylbenzene (23.8 ug/L), and toluene (5.85 ug/L) and were detected in three wells MW-4a, MW-7 and MW-9 located in the southern portion of the Site at concentrations exceeding their respective AWQS-TOGS 1.1.1.
- CVOCs including PCE (max. 70.60 ug/L), TCE (max. 46.50 ug/L), and cis-1,2-DCE (max. 19.4 ug/L) that exceeded AWQS - TOGS 1.1.1. were detected in five bedrock wells well MW-2a, MW-8, MW-10, MW-11, and MW-12 located in the northern portion of the Site and also in two wells MW-1a and MW-7 located along the western and southwestern Site boundaries.
- One SVOC, naphthalene (13.3 ug/L) was detected in MW-4a at concentration exceeding its respective AWQS-TOGS 1.1.1.
- No pesticides, herbicides or PCBs were detected in any samples.
- Total metals including manganese (max. 1,730 ug/L) in MW-2a through MW-5a and MW-7, mercury (0.8 ug/L) in MW-7 and sodium (max. 121,000 ug/L) in MW-2a through MW-5a and MW-7 through MW-9 were detected at concentrations exceeding their respective AWQS-TOGS 1.1.1. Dissolved metals including manganese (max. 1,740 ug/L) in MW-2a through MW-4a and MW-7 and sodium (max. 94,200 ug/L) in MW-2a through MW-5a and MW-7 through MW-9 at concentrations exceeding their respective AWQS-TOGS 1.1.1.

- 1,4-Dioxane (max. 0.416 ug/L) was detected in MW-3a and MW-5a at concentrations exceeding its respective AWQS-TOGS 1.1.1.
- Perfluorooctanesulfonic acid (PFOS) (max. 0.0401 ug/L) and PFOA (max. 0.034 ug/L) were detected in all samples at concentrations exceeding their respective AWQS – PFOA/PFOS.

2.5.5.2 Comparison of Groundwater with SCGs

Figure 9 (9A to 9D) provides spider maps showing the locations and levels of contamination in exceedances of AWQS-TOGS 1.1.1.

The contamination of concern in groundwater at the Site mainly consists of gasoline VOCs and chlorinated VOCs (CVOCs) at concentrations exceeding AWQS - TOGS 1.1.1. The gasoline VOCs impact is residual from the historically closed NYSDEC spill number 9711128, and this impact is currently confined to the southern and central portions of the Site in MW-4a, MW-7 and MW-9. The individual gasoline VOCs were detected at a maximum of 246 ug/L and included 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, ethyl benzene, isopropylbenzene, n-butylbenzene, n-propylbenzenewere, sec-butylbenzene, and p- & m- Xylenes.

Chlorinated solvents impact is currently is currently characterized by PCE, TCE, and cis-1,2-DCE and their highest concentrations with a maximum of 70.60 ug/L are detected in five bedrock wells located in the northern portion of the Site in MW-2a, MW-8, MW-10, MW-11 and MW-12 and in two wells located along the western and southwestern Site boundaries in MW-1a and MW-7. Based on the deep fractured-rock water flow system beneath the Site combined with the vertical and horizontal distribution of their concentrations detected across the Site, these CVOCs are likely to be associated with two off-Site historical dry cleaners located within 200 ft to the north/northeast of the Site as discussed in Section 2.5.1.

PCE and its derivative compounds were not detected in any shallow and deep soil collected at the Site and their detection in groundwater is likely to impact the soil vapor quality at the Site as discussed below.

2.5.6 Soil Vapor Contamination

Soil vapors consisting of gasoline VOCs and CVOCs were detected between 5 and 17 ft bgs across the Site. The highest soil vapor concentrations consisted of PCE detected at 1,100 ug/m^3 in SV-2A in the southwestern portion of the Site, and 2,2,4-trimethylpentane at 5,100 ug/m^3, o-xylene at 1,200 ug/m^3 and p-&m-xylene at 2,400 ug/m^3 detected in SV-4R-D from mid-eastern portion of the Site.

2.5.6.1 Comparison of Soil Vapor with SCGs

Figure 10 provides a spider map showing the soil vapor sampling locations and associated analytical data.

High concentrations of PCE are reported beneath the southern portion of the Site SV-2 and SV-2R. PCE and its derivative compounds were not identified in on-Site soil and their detection in soil vapor is likely associated with their occurrence in groundwater beneath the Site and were as attributed to an off-Site source as discussed above. Gasoline-related VOCs vapors also occurred across the entire Site, and their maximum concentrations are present in the immediate vicinity of the former tank area in the eastern portion in SV-4R-D. These gasoline vapors are a residual impact from the closed NYSDEC spill number 9711128.

2.6 Environmental and Public Health Assessments

A Qualitative Human Health Exposure Assessment (QHHEA) was conducted to identify potentially exposed human populations and to characterize their exposure settings and exposure pathways by evaluating the chemical fate and transport of identified Site contaminants i.e., VOCs, SVOCs, metals and PFAS in soil and groundwater, and VOCs in soil vapors at the Site, based on the RI results. An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site by considering the following five elements:

1. Receptor population;
2. Source of contamination;

3. Contaminant transport mechanism;
4. Point of exposure; and
5. Exposure routes.

An exposure pathway is complete when all these five elements are present, so that a contaminated site would pose a risk to human health or the environment. An exposure pathway may be eliminated from further evaluation when one of the five elements does not exist in the present site condition and will not exist in the future site condition.

2.6.1 Receptor Population

The receptor population includes the on-Site and off-Site people who are or may be exposed to Site contaminants based on the Site characteristics, the surrounding land uses, and the future use of the Site.

Currently, the Site consists of a vacant lot surrounded by a construction plywood fence with two one-story vacant buildings in the northwestern and central portions and a gasoline dispenser canopy in the southern portion. The Site is covered by asphalt pavement with some areas consisting of gravel as a result of backfilling activities related to the removal of former underground petroleum tanks in the eastern portion. Under the current scenario and the future redevelopment activities, individual receptors would only include Site ownership and their representatives, design engineers, demolition / construction / maintenance workers who may be employed to perform work on the property. Potential off-Site receptors include the general public consisting of adults, children, commercial workers, students, pedestrians, and cyclists.

Once the Site is redeveloped, the on-Site potential receptors will include adult and child residents, visitors, employees, maintenance workers, customers, vendors, and inspectors. Potential off-Site receptors within a half-mile radius of the Site include adult and child residents, commercial and construction workers, students, pedestrians, and cyclists, and utility personnels.

2.6.2 Source of Contamination

The source of contamination is defined as either the source of contaminant release to the environment or the impacted environmental medium (soil, water, soil vapor) at the point of exposure. As discussed in Section 2.5 the contaminants present in the Site media at elevated concentrations include VOCs, SVOCs, metals and PFAS in soil and groundwater, and VOCs in soil vapor.

2.6.3 Contaminant Transport Mechanism

Contaminant release and transport mechanisms carry contaminants from the source to points where people may be exposed to and are specific to the type of contaminant and Site use.

For contaminants in soil, their transport mechanism would include fugitive dust, as well as sediment transported onto roads by vehicles tires under current Site condition and also during Site excavation. Airborne contaminants and sediments transport are considered minimal under current Site conditions due to a restricted access to the Site by a plywood fence with a locked gate, and thus by maintaining undisturbed surface at the property. During Site excavation, the sediment transport onto roads by construction vehicles tires will be prevented by maintaining construction entrance pads to allow the dry brushing and/or hosing of trucks tires prior to leaving the Site. The airborne contaminants transport will be also controlled during excavation by continuous air monitoring and dust suppression measures as part of the CAMP.

For soil vapor contaminants, this relates to inhalation of organic vapors during Site excavation, and the potential indoor vapor intrusion under future development scenario. During Site excavation, organic vapors will be monitored in the air in accordance with the CAMP and the CHAPS and necessary actions will be undertaking upon exceeding the CAMP thresholds to prevent any exposure. Such action will include halting activities and wearing appropriate respiratory protection masks. The potential for indoor vapor intrusion pathway will be prevented under future development scenario by the installation of active SSDS below the building slab as a vapor mitigation system, and a vapor barrier system as a green remedy measure.

For contaminants in groundwater, the primary human health concern is associated with the use of groundwater as a potable water supply. No significant human exposure to contaminated groundwater from the Site is occurring at present nor will it occur in the future because the area is served by a public water supply.

2.6.4 Point of Exposure

The point of exposure is a location where actual or potential human contact with a contaminated medium may occur. Under current Site conditions, human exposure to contaminants in Site soil and groundwater may occur through direct contact, or to airborne contamination (volatile organics or fugitive dust). Construction and remedial workers are expected to be exposed to VOCs, SVOCs, metals and PFAS in surface and subsurface soil and in groundwater. Their greatest exposure to contaminated materials will be during ongoing installations for the support of excavation (SOEs), soil excavation, and potential dewatering activities. Therefore, all these remedial activities will be subject to strict health and safety in accordance to CHASP and air monitoring procedures in accordance to CAMP.

Upon completion of the remediation and redevelopment, there will be no future human exposures to contaminated soil , groundwater or soil vapor at the Site. When completed, the Site will be developed with a 12-story mixed-use building with a partial basement and an open rear yard. Under this new development scenario, the Site will have ECs consisting of a Site-wide composite cover system comprised of 6-inch-thick concrete slab on-grade and a 12-inch-thick concrete in partial basement, and also a soil vapor mitigation system consisting of an SSDS.

2.6.5 Exposure Routes

An exposure route is the mechanism by which a receptor comes into contact with a chemical. Three potential primary routes exist by which chemicals can enter the body including ingestion, inhalation, and dermal contact.

Under current Site conditions, exposure to Site contaminants is prevented by the restricted Site access that is limited to conducting visual assessments, only. Once redevelopment activities

begin, construction workers will come into direct contact with surface and subsurface soil and groundwater as a result of construction/excavation activities and potential dewatering activities, during which time there is a potential for dermal, ingestion or inhalation exposure pathways. Similarly, off-Site receptors could be exposed to particulates and soil vapors from on-Site activities. However, these pathways of impact will be controlled through continuous monitoring activities or air for organic vapors and dust emissions through a CAMP, as well as the implementation of a CHASP, so such exposure does not occur.

Under future Site development scenario, direct contact with contaminants in sub-surface soil or groundwater would be prevented by the composite cover system, i.e., the building slab and the concrete pavement in the rear undeveloped area. Soil vapor intrusion from VOCs remaining in groundwater into the new building will be prevented by the installation of a vapor mitigation system consisting of an SSDS above the groundwater table and below the basement/first floor foundations, and also the installation of a vapor barrier system beneath the new building as a green remedy measure. Therefore, potential exposure pathways are considered incomplete for future conditions. As such, potential exposures would only occur during Site remediation and construction but not under future use scenarios, thus not impacting the future occupants or the general public on-Site or off-Site.

2.6.6 Exposure Assessment

Based on the above assessment, potential exposure pathways to contaminants are considered incomplete on-Site or off-Site under current and future Site conditions. The NYSDEC and NYSDOH have determined this Site does not pose a significant threat to human health and the environment.

2.6.7 Fish & Wildlife Remedial Impact Analysis

NYSDEC DER-10 requires an on-Site and off-Site Fish and Wildlife Resources Impact Analysis (FWRIA). The Site will be developed into a 12-story mixed use residential and commercial building with open paved rear yard in a metropolitan area in the Norwood section

in Bronx of the New York City. The Site does not support any wildlife or natural waterway systems. Based on the requirements stipulated in Section 3.10 -Appendix 3C of DER-10, there was no need to prepare an FWRIA for The Site.

2.7 Remedial Action Objectives

Based on the results of the Remedial Investigation, the following Remedial Action Objectives (RAOs) have been identified for this Site.

2.7.1 Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

2.7.2 Soil

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

2.7.3 Soil Vapor

RAOs for Public Health Protection

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

3.0 SUMMARY REMEDIAL ACTION

3.1 Evaluation of Remedial Alternatives

- Protection of human health and the environment;
- Compliance with standards, criteria, and guidelines (SCGs);
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance;
- Green and Sustainable Remediation (including climate resiliency); and
- Land use.

3.2 Alternatives Analysis

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site during proposed Site development. . This analysis was prepared in accordance with 6 NYCRR Part 375-1.8(f) and Part 375-3.8(f) and Section 4.3(c) of NYSDEC DER-10. As required, the evaluation of alternatives includes Track 1 Unrestricted Use Cleanup scenario. In addition, two other alternatives including a Track 2 Restricted Residential/Protection of Groundwater Cleanup and a Track 4 Restricted Residential Cleanup are also evaluated, as follows:

3.2.1 Alternative 1 - Track 1 Unrestricted Use Cleanup:

- Establishment of Track 1 SCOs for the Site that include Unrestricted Use SCOs in Table 1.
- Removal of all soil/ fill exceeding Unrestricted Use (Track 1) Soil Cleanup Objective (SCOs) throughout the Site to the depth of competent bedrock or clean native material. Based on the findings of the 2025 RI, this Track 1 excavation shall extend beneath the required depths for the new development; i.e., to depths between 4 ft and 11 ft in the northern portion of the Site, to depths between 12 ft and 14 ft in the central portion, and to depths between 16 ft and 25 ft in the southern portion. Figure 11 provides a map of excavation for Track 1 cleanup. This excavation is anticipated to extend into interim unsaturated soil facilitated by extensive dewatering activities to ensure a complete removal of soil that does not meet Track 1 Unrestricted Use SCOs. Over excavation beyond that needed to achieve UUSCOs to accommodate development is not part of the selected remedy.
- Collection and analysis of confirmation soil samples to confirm unrestricted use SOCs have been achieved.
- Backfilling of excavated areas to development grade with certified-clean material (Protection of groundwater SCOs and Unrestricted Use SCOs), recycled concrete aggregate (RCA) or virgin, native crushed stone;
- Remediation of contaminated soil vapors and contaminated groundwater are the remedial goals for these two contaminated media that should be met within 5 years;
- Development and execution of plans for the protection of on-Site workers, community, and environment during remediation and construction activities;
- The Site will not have EC or SMP under this remedial alternative

3.2.2 Alternative 2 - Track 2 Restricted Residential/Protection of Groundwater Cleanup:

- Establishment of Track 2 SCOs for the Site that include the Restricted Residential SCOs and Protection of Groundwater SCOs in Table 2;

- Removal of all soil/ fill exceeding Restricted Residential SCOs and Protection of Groundwater SCOs in the upper 15 feet throughout the Site. Based on the RI data and the proposed development plan, this alternative would require a lesser degree of excavation than Alternative 1 to meet this SCO across the Site. The Track 2 cleanup is anticipated to be achieved by pursuing localized excavations of two contaminated hotspots that will extend from the surface down to at least 18 ft bgs in the central portion of the partial basement for the removal of gasoline VOCs, which exceeded RRSCOs and PGWSCOs at 18 ft bgs, and to at least 7 ft bgs in the northern portion of the open rear yard for the removal of the metals and SVOCs, which exceeded RRSCOs at 7 ft bgs. If proposed end-point sampling continues to show exceedances of Track 2 RRSCOs and PGWSCOs, over-excavation may be performed at either location until the Track 2 standards are achieved. Figure 12 provides a map of excavation for Track 2 cleanup. This Track 2 excavation may potentially extend into interim unsaturated soil that would require minimal dewatering activities.
- Confirmation that the Site-specific Track 2 SCOs have been achieved through post-excavation end-point sampling;
- Backfilling of excavated areas to development grade with certified-clean material (PGWSCOs and RRSCOs), recycled concrete aggregate (RCA) or virgin, native crushed stone;
- Installation of an active sub-slab depressurization system around the perimeter of the partial basement footprint to prevent soil vapor entering the new building at the Site;
- Implementation of a groundwater remedy beneath the southwester portion of the property to achieve the RAOs for groundwater
- Establishment of institutional controls in the form of an environmental easement for use restrictions including prohibitions on the use of groundwater from the Site and prohibitions on sensitive Site uses, such as farming or vegetable gardening, to eliminate future exposure pathways; and prohibition of a higher level of land use;

- Establishment of a Site Management Plan to ensure long-term management of these engineering and institutional controls including the performance of periodic inspections and certification that the controls are performing as they were intended.

3.2.3 Alternative 3 –Track 4 Restricted Residential Cleanup:

- Establishment of Site-specific Track 4 SCOs for the Site that include the Restricted Residential SCOs in Table 3;
- Removal of contaminated soil/fill in excess of restricted residential SCOs, at a minimum, in the upper 2 feet across the Site. Based on the RI data and the proposed development plan, this alternative is anticipated to require a lesser degree of excavation than Alternative 2 to meet this SCO across the Site. The Track 4 cleanup is anticipated to be achieved by pursuing localized excavations of two contaminated hotspots that will be removed from the surface down to at least 14 ft bgs in the central portion of the partial basement for the removal of gasoline VOCs which exceeded RRSCOs at 18 ft bgs, and to at least 4 ft bgs in the northern portion of the open rear yard for the removal of the metals and SVOCs which exceeded RRSCOs at 7 ft bgs. Figure 13 provides a map of excavation for Track 4 cleanup. This Track 4 excavation is not expected to extend into interim unsaturated soil that would require extensive dewatering activities.
- Confirmation that the Site-specific Track 4 SCOs have been achieved through post-excavation end-point sampling;
- Backfilling of the excavated area to development grade with certified-clean material (PGWSCOs and RRSCOs), recycled concrete aggregate (RCA) or virgin, native crushed stone;
- Installation of an active sub-slab depressurization system around the perimeter of the partial basement footprint to prevent soil vapor entering the new building at the Site;

- Installation of a Site cover system outside the basement footprint that will consisting concrete slabs on grade beneath the building and open areas;
- Implementation of a groundwater remedy beneath the western portion of the property to achieve the RAOs for groundwater
- Establishment of institutional controls in the form of an environmental easement for use restrictions including prohibitions on the use of groundwater from the Site and prohibitions on sensitive Site uses, such as farming or vegetable gardening, to eliminate future exposure pathways; and prohibition of a higher level of land use;
- Establishment of a Site Management Plan to ensure long-term management of these engineering and institutional controls including the performance of periodic inspections and certification that the controls are performing as they were intended.

3.3 Evaluation of the Preferred Remedy

The following sections provide an evaluation of Alternative 1, Alternative 2 and Alternative 3 based on the nine evaluation criteria as previously discussed.

3.3.1 Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1 would result in removal of all soil/fill with contaminant concentration above Track 1 SCOs. This alternative would be consistent with the RAOs and provide overall protection of public health and the environment in consideration of current and potential future land use by:

- Eliminating the potential for direct contact with contaminated on-Site soils, and
- Eliminating potential on-Site sources for production of soil vapors.
- Eliminating the risk of contamination leaching into groundwater.

Alternative 2 and Alternative 3 would achieve comparable protections of human health and the environment since all impacted soil/fill will be removed for purposes of construction and by ensuring that remaining soil/ fill on-Site meets either the Track 2 clean-up or the Track 4 cleanup as well as by placement of institutional and engineering controls, including an active SSDS system for the two alternatives and a cover system for Alternative 3. Implementing institutional controls including a Site Management Plan would ensure that the monitoring of groundwater remediation and the active SSDS remain operational and protective for a minimum of 5 years under Alterative 2 and beyond 5 years under Alterative 3. The SSDS system would protect new building from vapor intrusion.

For all the three Alternatives, potential exposure to contaminated soil or contaminated groundwater during construction activities would be minimized by implementing a Construction Health and Safety Plan (CHASP), a Soil and Materials Management Plan and a Community Air Monitoring Plan (CAMP). Potential contact with contaminated groundwater will be prevented during any dewatering activities and groundwater use is prohibited by City laws and regulations.. Potential future migration of off-Site soil vapors into the new building would be prevented by installing an active SSDS.

3.3.2 Compliance with Standards, Criteria and Guidance (SCGs)

This evaluation criterion assesses the ability of the alternative to achieve applicable standards, criteria and guidance.

Alternative 1 would achieve compliance with the remedial goals, SCGs and RAOs for soil through soil/fill removal to Track 1 Unrestricted Use SCOs. SCGs and RAOs for soil vapor and groundwater would also be achieved by eliminating any source.

Both Alternative 2 and 3 would achieve compliance with the remedial goals, SCGs and RAOs for soil through removal of impacted soil/fill to meet the Restricted Residential SCOs and

Protection of Groundwater SCOs for Alternative 2 - Track 2 cleanup, or removal of impacted soil/fill to meet the Restricted Residential SCOs and placement of a permanent engineered composite cover for Alternative 3 - Track 4 cleanup. Groundwater impacts under both Alternatives 2 and 3 will be remediated via in-situ bioremedial injections and it is unlikely that this groundwater remedial action will achieve its goal prior to the completion of remedial construction, and thus, continued groundwater monitoring will be required in the three existing monitoring wells MW-4a, MW-5a and MW-7 located in the vicinity of the treatment area in the southern portion of the Site. These three wells will be maintained or replaced during Site construction. SCGs for groundwater will be achieved under this remedial action by injection and the long-term reduction of petroleum contamination in groundwater will be realized under the monitored natural attenuation consistent with the RAOs established for the Site. Volatilization of chlorinated hydrocarbons to soil vapor on-Site from groundwater through the deep bedrock fractures would be managed by installing an active sub-slab depressurization system that would prevent vapor intrusion inside the new building at the Site. Compliance with SCGs for soil vapor is expected following completion of the remedial action. Both Alternative 2 and 3 will be subject to a Site Management Plan to ensure these controls remained protective for the long term.

Health and safety measures contained in the HASP and CAMP that comply with the applicable SCGs would be implemented during Site redevelopment under this RAWP. For all three Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would follow applicable SCGs. These measures will protect on-Site workers and the surrounding community from exposure to any Site-related concerns.

3.3.3 Short-Term Effectiveness and Impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental

impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

The three Alternatives 1, 2 and 3 have similar-short term effectiveness during their respective implementations, as each requires excavation of historic fill material. The three alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts would potentially be higher for Alternative 1 than Alternative 2 and 3 since excavation of greater amounts of historical fill material will be removed below the excavation depth of the proposed building. However, focused attention to means and methods during the remedial action during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities and any differences between these alternatives.

An additional short-term adverse impact and risks to the community associated with Alternative 1 versus Alternative 2 and 3 is increased truck traffic. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flaggers will be used to protect pedestrians at Site entrances and exits.

All three Alternatives 1, 2 and 3 would employ appropriate measures to prevent short-term impacts, including a Construction Health and Safety Plan, a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment. These alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a Health and Safety Plan (CHASP) will be protected from on-Site contaminants (personal protective equipment would be worn consistent with the documented risks within the respective work zones).

3.3.4 Long-Term Effectiveness and Permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of

remaining contamination, adequacy of controls including the adequacy and suitability of ECs/ICs that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of Engineering Controls.

Alternative 1 would achieve long-term effectiveness and permanence by permanently removing and/or remediating all soils, groundwater and soil vapors affected by Site contaminants.

Alternative 2 would provide long-term effectiveness by removing on-Site soil contamination exceeding the Track 2 SCOs across the Site, establishing Engineering Controls including an active SSDS along with in-situ groundwater treatment, establishing Institutional Controls to ensure long-term management including use restrictions, a Site Management Plan to memorialize these controls for the long term. Groundwater and soil vapor impacts would be expected to dissipate within 3 to 5 years after the issuance of COC.

Alternative 3 would achieve long-term effectiveness and permanence by removing soil contaminants above Track 4 SCOs across the Site and permanently covering all remaining soils contamination with an Engineering Control consisting of a composite cover. Similar to Alterative 2, Engineering Controls will be implemented for soil vapors via an active SSDS and groundwater impacts would be managed in-situ via remedial injections. These remedies will be subject to a long-term management beyond 5 years after the COC via Site Management Plan to memorialize these controls for the long term.

The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and use restrictions continue to be in place and are functioning as they were intended assuring that protections designed into the remedy will provide continued high level of protection in perpetuity.

3.3.5 Reduction of Toxicity, Mobility, or Volume of Contaminated Material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduces toxicity, mobility, or volume of contaminants as their

principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

Alternative 1 would achieve the greatest measure of long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above Track 1 Unrestricted Use SCOs. Removal of on-Site contaminant sources will prevent further groundwater contamination and soil vapor impacts. No Institutional Controls (ICs) or Engineering Controls (ECs) subject to an SMP will be required under a Track 1 cleanup.

Alternatives 2 and 3 would provide long-term effectiveness by permanently removing a sufficient amount of on-Site contamination, treatment of residual contamination in groundwater and soil vapor and attaining either Track 2 or Track 4 remedial objectives; maintaining use restrictions, establishing an SMP to ensure long-term management of Institutional Controls (ICs) as well as Engineering Controls (ECs). The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended assuring that protections designed into the remedy will provide continued high level of protection in perpetuity. Alternative 1 would eliminate a greater total mass of contaminants from soil on the Site.

All three alternatives 1, 2 and 3 would result in removal of soil contamination exceeding the SCOs providing the highest level, most effective and permanent remedy over the long-term with respect to a remedy for contaminated soil. Potential sources of soil vapor and groundwater contamination will also be eliminated or minimized as part of the remedy.

3.3.6 Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the

selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

Alternative 1 would be difficult to implement because much contamination is present below the water table beneath the Site and its removal would require extensive dewatering, sheeting and shoring. However, standard excavation technology would be utilized. Removal of all contamination above Track 1 SCOs would ultimately achieve GQS and eliminate the source of contamination to groundwater and their further emissions to soil vapor.

Alternatives 2 and 3 are feasible and implementable. Both alternatives use standard materials and services and well-established technology. The contaminated soil can be readily removed using standard excavation technology to the required depth of building foundations. Other areas exceeding Site specific SCOs would be readily removed when encountered. The reliability of the remedy is also high. There are no special difficulties associated with any of the activities proposed which utilize standard industry methods. The dewatering design, which might be anticipated for Track 2 cleanup, can be easily implemented in compliance with city, state, and federal laws and regulations in order to complete the excavation of the deep hotspot below the natural depth of groundwater in the central portion of the Site. Covering of soils with a composite cover under Track 4 cleanup uses standard technology common in the industry and is a reliable method which has a long and proven track record in preventing direct contact with affected soils. The implementation of an SSDS under Track 2 and Track 4 cleanup is a common and highly effective method of mitigating vapor intrusion. The proposed groundwater treatment and monitoring program for both Track 2 and Track 4 cleanup is also implemented using standard technology and common materials.

3.3.7 Cost Effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, dewatering costs, equipment costs, disposal costs, backfilling costs and engineering expenses) and Site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

Remedial costs associated with Alternative 1 are estimated at $1,815,000 and it is significantly the highest compared to the cost for Alternative 2 and Alternative 3 that are estimated at approximately $1,124,000 and $1,324,000, respectively. Alternatives 2 and 3 have common remedial elements (active SSDS and groundwater treatment). However, Alternative 3 requires a composite cover system as EC, and also it has long-term costs that are higher than Alternative 2 due to the implementation of Site Management Plan beyond the minimum of 5 years for Alternative 2. Estimated costs for each remedial alterative is provided in Appendix C.

3.3.8 Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. Observations here were supplemented by public comments received on the RAWP.

Based on the overall goals of the remedial program and the intended Site use, it is anticipated that all Alternatives 1, 2 and 3 for the Site would be acceptable to the community. This RAWP will be subject to a 45-day in accordance with the Citizen Participation Plan (CPP), included as Appendix D. Substantive public comments will be addressed before the remedy is approved.

3.3.9 Green and Sustainable Remediation and Climate Resiliency

To evaluate the remedial alternatives with respect to GSR principles as part of the remedial program, environmental footprint analysis was conducted for Alternative 1 (Track 1 remedy), and Alternative 2 (Track 2 remedy) / Alternative 3 (Track 4 remedy) using SEFA. The results of the environmental footprint analysis and climate screening are provided in Appendix E. In this analysis, Alternative I, which potentially requires the excavation and export of a greater volume of non-hazardous waste, along with excessive SOEs, dewatering activities and import of a large volume of clean backfill would result in higher GSR metrics than Alternative 2 and Alternative 3 remedies.

3.3.10 Land use

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the Site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the Site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

The proposed redevelopment of the Site is compatible with its current R7D residential with C2-4 commercial overlay zoning. Following remediation, the Site will meet either Track 1 Unrestricted Use (Alternative 1), Track 2 Restricted Residential use (Alternative 2) or Track 4 Restricted Residential use (Alternative 3), all of which are appropriate for its planned mixed residential and commercial use. Improvements in the current environmental condition of the property achieved by these three alternatives are also consistent with the BCP goals for cleanup of contaminated land and bringing such properties into productive reuse. The three alternatives are equally protective of natural resources and cultural resources.

3.4 Selection of the Preferred Remedy

The recommended remedy for the Site consists of Alternative 3, which includes Track 4 for Restricted-Residential Use at Site. As a contingency, Alternative 2, which includes Track 2 for Restricted-Residential Use with the lower of Protection of Groundwater SCOs is also contemplated for this Site if conditions are met depending on the confirmation end-point sampling results.

As required by Article 27, Title 14 of the Environmental Conservation Law 27-1415, the following land use factor evaluation examines whether the preferred alternative is acceptable based on the 14 criteria presented in the following subsections.

3.4.1 Zoning

The proposed development of the Site will consist of a 12-story mixed-use building with a partial basement and a rear yard that is compatible with its current NYC local zoning designation R7D general residential district with C2-4 commercial overlay in the New York City Planning Commission. In addition, this development will be 100% affordable rental housing project that is sponsored by the New Department of Housing Preservation and Development (HPD) and the New York City Housing Development Corporation (HDC).

3.4.2 Applicable Comprehensive Community Master Plans or Land Use Plans

As discussed in the BCA, the Site remedial construction is an as-of right development that is consistent with local city resolutions and local community plans. Besides, the proposed redevelopment project and selected remedy are consistent with comprehensive master and land use plans, specifically the Webster Avenue rezoning action (CEQR No. 10DCP035X). This area-wide comprehensive re-zoning was completed by the New York City Department of City Planning and adopted by the City Council in Marcj 2011. Besides, this entire new development is taking place within a designated NYC Environmental (EN) zone and also within a disadvantaged community. The preferred remedy will be in full compliance with this applicable land use plan.

3.4.3 Surrounding Property Uses

The remedial method selected for the Site will not impact upon surrounding property uses. The surrounding land use is primarily multifamily residential buildings to the north, west, and south and a multifamily residential building and two day-care facilities and autobody repair

facility to the east. The proposed remedy will not interfere with surrounding property uses and considers the short-term effects to neighboring properties.

3.4.4 Citizen Participation

Citizen participation for implementation of the preferred alternative will be performed in accordance with DER 23 and NYCRR Part 375-1.10 and Part 375-3.10. A Citizen Participation Plan (CPP) has been prepared in Appendix D and is available for public review at the identified document repositories (NYSDEC Region 2 Office, New York City Public Library – Mosholu Branch and the Bronx Community Board 07. The citizens are likely to welcome the proposed Site remedial development into 100% affordable residential building and be remediated to Track 2 cleanup objective and guidelines.

3.4.5 Environmental Justice

The Site is located in an Environmental Justice Area, with a Hispanic American a population nearby. As noted in the CPP, communications will be maintained with the public on all steps all Site remediation and redevelopment via fact sheets that will be translated into Spanish.

3.4.6 Proximity to Natural Resources

The proposed remedy will improve the local environment and will not negatively impact of affect any natural resources.

3.4.7 Off-Site Groundwater Impacts

Based upon groundwater mapping programs, it appears that the petroleum impact at the Site originated from the former gasoline USTs fields in the eastern portion of the Site and this impact was delineated beneath the southern portion. Chlorinated hydrocarbons are also present at low concentrations in groundwater beneath the Site and their source was determined to be from two

off-site historic drycleaners located within 200 ft to the north/northeast of the Site (see Figure 5). Following Site cleanup, and consistent with the treatment of gasoline impacted groundwater via injections and also the mechanism of a natural attenuation, no off-Site groundwater impacts or soil vapor intrusion associated with the Site contaminants is expected to occur.

3.4.8 Proximity to Floodplains

According to the FEMA National Flood Hazard Layer (NFHL), the Site is not within a special flood hazard area.

3.4.9 Current Institutional Controls

There are currently no institutional controls assigned to the site.

3.5 Summary of Selected Remedial Actions

A Track 4 cleanup is proposed for this Site. This Site remedy might be upgraded to a Track 2 cleanup if Track 2 conditions are met following Site remediation.

Selected Track 4 cleanup consists of the following remedial components:

1. A remedial program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and Site management of the remedy as per DER-31. The major green remediation components are as follows:
    - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
    - Reducing direct and indirect greenhouse gases and other emissions;
    - Increasing energy efficiency and minimizing use of non-renewable energy;
    - Conserving and efficiently managing resources and materials;

- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this Site, any future on-Site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

As part of the remedial program, to evaluate the remedy with respect to green and sustainable remediation principles, an environmental footprint analysis was completed and is included in Appendix E. The environmental footprint analysis was completed using an accepted environmental footprint analysis calculator such as SEFA (Spreadsheets for Environmental Footprint Analysis, USEPA). Water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste reduction and material use will be estimated, and goals for the project related to these green and sustainable remediation metrics, as well as for minimizing community impacts, protecting habitats and natural and cultural resources, and promoting environmental justice, will be incorporated into the remedial program, as appropriate. The project will include detailed requirements to achieve the green and sustainable remediation goals. Further, progress with respect to green and sustainable remediation metrics will be tracked during implementation of the remedial action and reported in the Final Engineering Report (FER), including a comparison to the goals established during the remedial program.

Additionally, the remedial program will include a climate change vulnerability assessment, to evaluate the impact of climate change on the project Site and the proposed

remedy. Potential vulnerabilities associated with extreme weather events (e.g., hurricanes, lightning, heat stress and drought), flooding, and sea level rise will be identified, and the remedial program will incorporate measures to minimize the impact of climate change on potential identified vulnerabilities. Climate change is not expected to have a significant impact on the remedial system.

2. Excavation of soil/fill exceeding Site-specific Track 4 Restricted-Residential cleanup across the entire of Site. The intended SCOs for this Site are listed in Table 3. This cleanup will require excavation of two hotspots to the depth of 2 feet beneath the future cover on-Site as follows:
    - Excavation to 4 ft bgs in the vicinity of RI soil borings SP-6 and SP- 10 to remove the barium and chromium trivalent, which exceeded RRSCOs to the depth of 7 ft bgs in the proposed area of the rear yard; and,
    - Excavation to 14 ft bgs in the vicinity of RI soil borings TP-1 to remove the xylenes and 1,2,4 trimethylbenzene, which exceeded RRSCOs and PGWSCOs at the depth of 18 ft bgs in the central portion of the proposed partial basement.
3. Development and implementation of a Construction Health & Safety Plan (CHASP) and Community Air Monitoring Plan (CAMP) for the protection of on-Site workers, community/residents, and the environment during remediation and construction activities;
4. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
5. Decommissioning of on-Site monitoring wells in accordance with NYSDEC CP-43 Policy;
6. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of Track 4 SCOs;
7. If encountered, excavation and removal of any underground storage tanks (USTs), underground piping or other structures associated with a source of contamination will be disposed of off-Site. Soil screening will be conducted throughout the excavation phase for indications of contamination (by visual means, odor, and monitoring with PID).

8. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal. Waste disposal facilities will be selected based on the data collected to date and a waste classification sampling. Approximately 5,600 cubic yards (est. 8,400 tons) of soil/fill will be excavated and removed from the Site;

9. Import of materials to be used for backfill and cover in compliance with: (1) chemical limits and other specifications included in Table 2 for RRSCOs and PGWSCOs, (2) all Federal, State and local rules and regulations for handling and transport of material;

10. Construction and maintenance of a Site cover consisting of both a 6-inch-thick concrete slab on-grade and a 12-inch-thick concrete basement slab underlain by compacted bluestone and 6-inch-thick concrete slab in open year yard to prevent human exposure to residual contaminated soil/fill remaining under the Site;

11. Installation of an active sub-slab depressurization system (SSDS) to mitigate the potential soil vapor intrusion from residual gasoline VOCs in groundwater and off-Site chlorinated VOCs into the new building. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible;

12. Following remedial actions and prior to occupancy, an SSDS Efficacy Sampling Work Plan will be submitted to NYSDEC for approval. This work plan involves indoor air sampling in the partial basement and the first floor of the building to verify that no volatilization of on-Site or off-Site contaminants would impact the indoor air quality of the new building at the Site;

13. Recording of an Environmental Easement, including Institutional Controls, to prevent future exposure to any residual contamination remaining at the Site;

14. Publication of a Site Management Plan for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting;

15. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP and the NYSDEC-issued Decision Document. All deviations from the RAWP and/or Decision Document will be promptly reported to NYSDEC for approval and fully explained in the FER.

With the intent of upgrading the Track 4 remedy to a Track 2 cleanup, the two soil hotspots may be over excavated during Site remediation to remove contaminants below the depth of their RI exceedance in order meet the Track 2 standards for RRSCOs and PGWSCOs listed in Table 2. The attainment of a Track 2 cleanup will be confirmed by the collection and analysis of end-point samples. Under a Track 2 cleanup, the same remedial components of the Track 4 cleanup listed above will be applied except for the need of a composite cover system as EC.

4.0 REMEDIAL ACTION PROGRAM

4.1 Governing Documents

Governing documents and procedures included in the RAWP include the following:

4.1.1 Standards, Criteria and Guidance (SCGs)

The following standards, criteria, and guidance are typically applicable to Remedial Action projects in New York State and will be consulted and adhered to, as applicable:

- 6 NYCRR Part 364 - NYS Waste Transporter Permits
- 6 NYCRR Part 360 - NYS Solid Waste Management Requirements
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes
- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Part 375 - Environmental Remediation Programs
- 6 NYCRR Part 376 - Land Disposal Restrictions
- 6 NYCRR Part 613 - Petroleum Bulk Storage
- 6 NYCRR Part 750 - State Pollutant Discharge Elimination System (SPDES) Permits
- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- 40 CFR Part 144 - Underground Injection Control Program
- CP-43 - Commissioner Policy on Groundwater Monitoring Well Decommissioning (December 2009)
- CP-49 – Climate Change and DEC Action (2022)
- CP-51- Soil Cleanup Guidance (2010)
- CP-60 – Screening and Assessment of Contaminated Sediment (2014)
- DER-2 - Making Changes to Selected Remedies (April 2008)
- DER-10 – Technical Guidance for Site Investigation and Remediation (2010)
- DER-13 – Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York (2006)

- DER-23 – Citizen Participation Handbook for Remedial Programs (2010)
- DER-31 – Green Remediation (2010)
- DER-32 – Brownfield Cleanup Program Applications and Agreements (2017)
- DER-33 – Guide to Drafting and Recording Institutional Controls (2010)
- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations (1998, Addenda 2000, 2004 and 2023)
- TOGS 1.3.8 - New Discharges to Publicly Owned Treatment Works (1994)
- TOGS 2.1.2 - Underground Injection/Recirculation (UIR) at Groundwater Remediation Sites (1990)
- New York State Standards and Specifications for Erosion and Sediment Control (2016)
- DAR-1 (formerly Air Guide 1) - Guidelines for the Control of Toxic Ambient Air Contaminants (1997)
- U.S. EPA OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (December 1997)
- New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2006)
- New York State Climate Act (2019)
- NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (2023)

4.1.1.1 Green and Sustainable Remediation and Climate Resiliency

To the extent feasible, HydroTech, the Volunteer and its subcontractors will incorporate sustainable practices with the goal to reduce the environmental footprint of the preferred

Alternative 3 - Track 4 cleanup as per DER-31. The major green remediation components of the proposed remedial action are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development;
- Incorporate green remediation principles and techniques to the extent feasible in the new development at this Site, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction; and,
- Incorporate best management practices consisting of the following measures:
    1. Limit the use and idling of generators and vehicles to reduce emissions.
    2. Minimize truck travel for disposal of waste disposal during groundwater sampling by selecting local disposal facilities.
    3. Manage on-Site resources and materials efficiently.
    4. Use local subcontractors to minimize vehicle emissions during commute.
    5. Request that subcontractors use clean diesel equipment to reduce emissions.
    6. Reduce the use of water used for decontamination of equipment.
    7. Request project staff and subcontractors to use public transportation to the extent practicable.
    8. Reduce waste, increasing recycling and increasing reuse of materials that would otherwise be considered waste.

A completed climate screening checklist for the remediation phase is provided in Appendix E. Progress of green and sustainable remediation metrics will be tracked during the implementation of the remedial action under the Green Remediation Implementation Plan and using a NYSDEC DER-accepted model, and any tracking methods. The results of the environmental footprint analysis will be reported in updated checklists in on the FER.

4.1.2 Site Specific Health & Safety Plan (HASP)

All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal OSHA.

The Volunteer and associated parties preparing the remedial documents submitted to the State and those performing the construction work, are completely responsible for the preparation of an appropriate Health and Safety Plan and for the appropriate performance of work according to that plan and applicable laws.

The Health and Safety Plan (HASP) and requirements defined in this Remedial Action Work Plan pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion. A Corporate Site Safety Coordinator will be assigned to the Site prior to the start of remedial action in accordance with NYC DOB Site safety codes and requirements to monitor the safe work practices and the health and safety of construction personnel. Confined space entry will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gases. A copy of the Health and Safety Plan is provided in Appendix F.

4.1.3 Quality Assurance Project Plan (QAPP)

The Quality Assurance (QA) objective of the remedial action sampling with respect to accuracy, precision, and sensitivity of its analytical methods by the laboratory is to achieve the Quality Control (QC) acceptance of the analytical results. Collected samples during this remedial

action will be subject to QA/QC protocols summarized in the QAPP provided under Appendix G.

4.1.4 Construction Quality Assurance Plan (CQAP)

A general Construction Quality Assurance Plan (CQAP) will be prepared for the new development by the General Construction Manager. All construction-related remedial activities including intrusive and soil disturbance activities will be monitored by a HydroTech QEP under the direct supervision of the Remedial Engineer. Monitoring during soil excavation will be performed to protect the health of Site workers and the surrounding community. A Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) have been specifically developed for this project. These plans specify the monitoring procedures, action levels, and contingency measures that are required to protect public health. The QEP under the direct supervision of the Remedial Engineer will record observations in the Site field book and complete a photographic log of the daily activities. The QEP will provide daily updates to the Project Manager and Remedial Engineer who will both make periodic visits to the Site as needed to assure construction quality.

Key entities and personnel responsibilities during the implementation of Remedial Action include:

Entity Name	Personnel Name	Title	Contact Information
6014 BCD Realty, LLC	Michael Froning	Applicants Representative	Msfroning@skfdevelopment.com 347-615-9235
SKF Development, LLC	Dan Kapustin	General Construction Manager	dkapustin@skfdevelopment.com 845-608-4461

Becall Engineering Services	John Alleyne	Architect	(914) 662-7902
Wexler Associates	Neil Wexler	Structural Engineer	(212) 643-1500
Wexler Associates	Neil Wexler	Foundation/Excavation Sub-Contractor	(212) 643-1500
Lombardo Professional Engineering	Michael Lombardo	Site Safety	(718) 482-3992
HydroTech	Tarek Z. Khouri, P.E.	Remedial Engineer	201-913-4325 tkhouri@hydrotechenvironmental.com
	Paul I. Matli	QEP	631-241-7165 pmatli@hydrotechenvironmental.com
Coastal Environmental Solutions	Marc Morgenstern	Groundwater Remedial Injections Sub-Contractor	631-256-6974

4.1.5 Soil/Materials Management Plan (SoMMP)

An SOMMP is included as Section 5.0 and provides detailed plans for managing all soils/materials that are disturbed at the Site, including excavation, handling, storage, transport

and disposal. It also includes all of the controls that will be applied to these efforts to ensure effective, nuisance-free performance in compliance with all applicable Federal, State and local laws and regulations.

4.1.6 Erosion and Sediment Control Plan (ESCP)

The erosion and sediment controls will be in conformance with requirements presented in the New York State Standards and Specifications for Erosion and Sediment Control.

Silt fence will be installed around the entire Site perimeter and soil stockpile area and inspected daily to ensure proper operation. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the sediment control measures functional.

Selected ESC measures will be installed prior to ground disturbance and maintained throughout the duration of construction to minimize the potential for discharge of pollutants and prevent a potential violation of the water quality standards in conformance with the New York Standards and Specifications for ESC (November 2016). The ESC measures to be implemented during the RA are described in Section 4.3.3.

The Site is exempt from the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-02-01) requirement as the area disturbed on the Site will be less than one acre in size.

4.1.7 Community Air Monitoring Plan (CAMP)

The CAMP provides measures for real-time protection for on-Site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-Site workers not directly involved in the remedial work) from potential VOCs or airborne dust released during invasive remedial activities. The CAMP will include three Aethair® air quality monitors with Environet web-based environmental data management platform on a daily basis.

This air monitoring product is capable of recording real-time air quality monitoring data and calculating 15-minute averages. A CAMP is provided under Appendix H.

4.1.8 Contractors Site Operations Plan (SOP)

The Remedial Engineer has reviewed all plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and confirms that they comply with this RAWP. The Remedial Engineer is responsible to ensure that all later document submittals for this remedial project, including contractor and sub-contractor document submittals, comply with this RAWP. All remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

4.1.9 Citizen Participation Plan

A certification of mailing will be sent by the Volunteer to the NYSDEC project manager following the distribution of all Fact Sheets and notices that includes: (1) certification that the Fact Sheets were mailed, (2) the date they were mailed; (3) a copy of the Fact Sheet, (4) a list of recipients (contact list); and (5) a statement that the repository has received and it contained all of applicable project documents.

No changes will be made to approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing.

The approved Citizen Participation Plan for this project is attached in Appendix D.

Document repositories have been established at the following locations and contain all applicable project documents:

New York Public Library - Mosholu
285 E 205th Street
Bronx NY 10467
Phone: 718-882-8239

Hours:
Monday-Thursday: 11 AM–7 PM
Friday-Saturday: 10 AM–5 PM

Bronx Community Board 7
229-A East 204th Street
Bronx, NY 10458
Yajaira Arias, Chairperson
Betty Arce, Chairperson – Environmental & Sanitation Committee
Phone: 718-933-5650
Hours:
Monday-Friday: 9AM-5PM

In addition, an electronic repository can be accessed via DECInfo Locator at the following link: https://extapps.dec.ny.gov/data/DecDocs/C203184/.

4.2 General Remedial construction information

4.2.1 Project Organization

HydroTech is the environmental consultant and the remedial engineer responsible involved in the performance of the Remedial Action at the Site. Key personnel of HydroTech involved in this project include:

Individual Name	Title
Tarek Z. Khouri, PE	Remedial Engineer
Paul I. Matli, PhD, PG	Project Geologist/Project Manager /QEP
Marie Rose Farah	Assistant Project Manager/Assistant QEP

Resumes of key personnel involved in the Remedial Action are included in Appendix I.

4.2.2 Remedial Engineer

The Remedial Engineer for this project will be Tarek Z. Khouri, PE. 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 remedial program for the 3083 Webster Ave BCP Site (NYSDEC BCA Index No. C203184-04-25, Site No. C203184). The Remedial Engineer will certify in the Final Engineering Report that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

The Remedial Engineer will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of back fill material, and management of waste transport and disposal. The Remedial Engineer will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The Remedial Engineer will review all pre-remedial plans submitted by contractors for compliance with this RAWP and will certify compliance in the Final Engineering Report.

The Remedial Engineer will provide the certifications listed in Section 10.1 in the FER.

4.2.3 Remedial Action Construction Schedule

Currently, an 18-month remediation construction schedule is anticipated. Refer to Section 11.0.

4.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings (DOB) construction code requirements or according to specific

variances issued by that agency. NYSDEC will be notified by the Volunteer of any variances issued by DOB. NYSDEC reserves the right to deny alternate remedial construction hours.

4.2.5 Site Security

The Site will be secured at all times in accordance with NYC DOB Codes through a construction fence erected around the Site perimeter by enclosing the adjacent sidewalk to the northwest of Webster Avenue. A main gate and a secondary gate will be installed at the main Site entrance/egress points in the southern and eastern portions of the Site. The gates will be locked at the end of each workday.

4.2.6 Traffic Control

Proper traffic controls for both the Site remedial action and the general Site construction activities will be managed by the Participants construction management, and they will be performed in accordance with NYC DOB Codes and per NYC DOT regulations. Traffic controls related to on-going remedial activity will require the staging of 10-wheel dump trucks on Freeman Street on a daily basis during soil excavation and disposal activity. A map showing the truck routes is included as Figure 14.

4.2.7 Contingency Plan

A contingency plan is discussed in Section 5.4.11 to prevent and manage any potential release from unexpected contaminated media or underground tanks that may be encountered during the implementation of this remedial action.

4.2.8 Worker Training and Monitoring

Remedial work performed under this Remedial Action will be in full compliance with applicable health and safety laws and regulations, including NYC DOB Site Safety and OSHA worker safety requirements and HAZWOPER requirements. All workers will be trained in

accordance with NYC DOB Codes and in accordance with the Construction Health and Safety Plan provided under Appendix F.

The Site Safety Officer employed by the General Contractor will be responsible for maintaining all on-Site workers' training records in accordance with NYC DOB Site safety requirements. Personnel entering any exclusion zone will be required to present the necessary HAZWOPER training certifications. All personnel engaged in any activities associated with remedial action, including any sampling activities, must receive adequate sites specific training in the form of an on-Site Health and Safety briefing prior to participating in fieldwork activities.

4.2.9 Agency Approvals

The Volunteer has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction.

The planned end use for the Site is in conformance with the current zoning for the property as determined by New York City Department of City Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

A complete list of all federal, state and local government permits, certificates or other approvals or authorizations required to perform the remedial and development work will be provided in the FER. This list includes a citation of the law, statute or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the Final Engineering Report.

All planned remedial or construction work in regulated wetlands and adjacent areas will be specifically approved by the NYSDEC Division of Natural Resources to ensure that it meets the requirements for substantive compliance with those regulations prior to the start of construction. Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose.

4.2.10 Pre-Construction Meeting with NYSDEC

A pre-construction meeting must take place prior to the start of any remedial construction activities at the Site, and it will involve the NYSDEC, Volunteer's representative, Remedial Engineer, Project Manager and General Construction Manager. The meeting will be scheduled with the NYSDEC at least 7 days prior to the start of any activities.

4.2.11 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in the HASP in Appendix F. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

4.2.12 Remedial Action Costs

The total estimated cost of the Remedial Action is approximately $1,234,000 for Track 4 cleanup. An itemized and detailed summary of estimated costs for all remedial activity is attached as Appendix C. This will be revised based on actual costs and submitted as an appendix to the Final Engineering Report.

4.3 Site Preparation

4.3.1 Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the Site remedial operations and related HASP and CAMP and procedure to be followed during the implementation of this RAWP.

Equipment and materials delivered to the Site will be stored and staged on-Site in a manner that complies with applicable laws and regulations. The locations of proposed equipment and material staging areas will be determined by the General Construction Manager in coordination

with the remedial project manager by considering pertinent remedial management features during the Site preparation activities.

4.3.2 Monitoring Well Decommissioning

Nine (9) of the monitoring wells currently present at the Site will be properly decommissioned in accordance with NYSDEC Commissioners Policy CP-43. Three (3) other wells identified as MW-4a, MW-5a and MW-7 will be preserved and protected during Site remediation and development for use in the post-remedial monitoring of groundwater quality. These three wells shall be reinstalled if they are destroyed or become unusable during Site remediation. Figure 15 provides a map showing the location of monitoring wells to be preserved or decommissioned.

4.3.3 Erosion and Sediment Controls

Erosion and Sedimentation Controls (ESC) measures for the management of stormwater will be installed in accordance with the New York Guidelines for Urban ESC and per Section 5.4.10 for stormwater pollution prevention, and Section 5.4.11 for storm preparedness and response.

4.3.4 Stabilized Construction Entrance(s)

A temporary crushed stone/recycled concrete aggregates (RCA) pad will be installed at the points of vehicle ingress and egress to the Site on the northeastern and southern Site boundaries along Webster Avenue. These construction entrance pads will be maintained to allow the dry brushing of trucks and/or hosing of trucks tires and undercarriages prior to leaving the Site to reduce the amount of Site soil transported onto roads by construction vehicles. The stabilized entrance pads will be constructed of minimum thickness of 4 inches crushed stone or crushed concrete and will be sloped back toward the interior of the Site. Stabilized entrances will be inspected on a daily basis during soil loading activities and reinforced as needed with additional stone/concrete material to prevent the accumulation of mud or soil.

4.3.5 Utility Marker and Easements Layout

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this Remedial Action Work Plan is posed by utilities or easements on the Site.

4.3.6 Sheeting and Shoring

Appropriate management of structural stability of on-Site or off-Site structures during on-Site activities include excavation is the sole responsibility of the Volunteer and its contractors. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals that may be required to perform work under this RAWP. Further, the Volunteer and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved RAWP.

4.3.7 Equipment and Material Staging

All equipment and material will be staged on-Site by the General Contractor as per NYC DOB requirements and consistent with pertinent remedial management features.

4.3.8 Decontamination Area

Temporary construction entrance pads will be installed and stabilized at the points of vehicle ingress and egress to the Site. The construction entrance pads will be constructed by placing stone aggregate or RCA in a manner that will serve its purpose as a truck decontamination pad to clean and decontaminate the tires of truck and other vehicles/equipment leaving the Site. Vehicles exiting construction areas will be cleaned using clean water or dry brushing, as needed, to remove Site soil from the tires. The pads will be sloped back to the interior of the Site. Soil on the truck pad will be removed with the truck pad removal and loaded out with excavated soil to an off-Site disposal facility.

4.3.9 Site Fencing

An 8-foot-high construction fence with locked access gates will be installed around the perimeter of the property and maintained in accordance with New York City Department of Building requirements to ensure on-site worker safety and also Site security during working and non-working hours.

4.3.10 Demobilization

Demobilization will consist of the following tasks:

- Restoration of areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management area[s], and access area);
- Removal of temporary access areas (whether on-Site or off-Site) and restoration of disturbed access areas to pre-remediation conditions;
- Removal of sediment and erosion control measures and disposal of materials in accordance with acceptable rules and regulations;

- Equipment decontamination;
- General refuse disposal.

4.4 Reporting

All daily and monthly Reports will be included in the Final Engineering Report.

4.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by noon of each day following the reporting period and will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- References to alpha-numeric map for Site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP findings, including exceedances of VOCs and dust monitoring thresholds;
- Photographs of Site activities;
- An explanation of notable Site conditions.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information. However, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

Daily Reports will include a description of daily activities keyed to an alpha-numeric map for the Site that identifies work areas. In addition, these reports will include corrective actions

taken to address CAMP exceedances, a map showing the CAMP stations locations with the predominant wind direction(s), and complaints received from the public.

A Site map that shows a predefined alpha-numeric grid for use in identifying locations described in reports submitted to NYSDEC is attached in Figure 16.

The NYSDEC assigned project number will appear on all reports.

4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the 10th day of each month following the reporting period and will include:

- Activities related to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (e.g., tons of exported and imported material, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and,
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.
- Tracking of GSR metrics determined during the design process should be included in monthly reports.

4.4.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital (JPEG) format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided.

Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the FER.

Progress with respect to green and sustainable remediation metrics will be tracked during implementation of the remedial action and reported in the FER, including a comparison to the climate screening analysis for the remediation phase provided in this RAWP as Appendix E. The Climate Screening process and results will be documented in the form of a completed checklist and brief letter report. If the Climate Screening results indicate that a Climate Vulnerability Assessment (CVA) is necessary, a complete CVA Report will be developed. The CVA Report will be included as an appendix or attachment in relevant documents and/or submitted as a standalone report.

Job-Site record keeping for all remedial work will be appropriately documented. These records will be maintained on-Site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

4.4.4 Complaint Management Plan

Public complaints regarding nuisance consisting of noise, odor or traffic controls will be directed to the remedial project manager and will be recorded in the Site field book and reported to the NYSDEC via email and daily reports. The project manager, in consultation with the Construction General Manager, will review and investigate the complaint and will take the necessary measures to mitigate its cause and the action taken in this regard will be reported to NYSDEC.

4.4.5 Deviations from the Remedial Action Work Plan

If conditions arise that require deviation from this RAWP, the Remedial Engineer in consultation with the Volunteer will contact NYSDEC Project Manager immediately to notify for conditions requiring immediate action, discuss its effect on the overall remedy, what changes are required and request approval. All deviations from the RAWP will be implemented upon

receiving a written approval from NYSDEC Project Manager and these deviation actions will be documented thoroughly in the daily reports and in the FER.

5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

As part of the proposed remedial construction at the Site, the 12-inch-thick slab for the partial basement of the new building will be installed at approximately 13 ft bgs, and therefore, the top 13 ft within the perimeter of the partial basement will be excavated and removed. The partial basement is set back 9 ft and 13 ft from the property lines to the west and east to allow excavation of soil to the levels of adjacent building foundations and the installation of berms at 45-degree angle on these sides in lieu of installing SOEs to the levels of partial basement foundations at 16 ft bgs. Soil will also be removed in localized areas to 16 ft bgs for the basement foundation footings, to the depth of 7 ft bgs for the on-grade slab and foundations in the northwestern portion of the building, and to the depth of 2 feet across the remainder of the Site. An elevator pit will be excavated to 23 feet beneath the central portion of the basement, and this excavation may potentially extend below the natural depth of groundwater requiring dewatering activities. Two contaminated hotspots exceeding the Track 4 RRSCOs will also be removed during this new development; to 4 ft bgs in the vicinity of RI soil borings SP-6 and SP-10 to remove the barium and chromium trivalent, which exceeded RRSCOs to the depth of 7 ft bgs in the proposed area of the rear yard, and to 14 ft bgs in the vicinity of RI soil borings TP-1 to remove the xylenes and 1,2,4 trimethylbenzene, which exceeded RRSCOs and PGWSCOs at the depth of 18 ft bgs in the central portion of the proposed partial basement. With the intent of upgrading the Site remedy to Track 2 cleanup, these two hotspots may be over excavated below the depth of RI exceedances to remove any residual contamination above RRSCOs and PGWSCOs. The excavation for the partial basement will not extend to the groundwater table, however, the groundwater might be encountered during the excavation for the elevator pit, which may require dewatering prior to or during the excavation. If required, dewatering will occur in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-Site disposal at a licensed or permitted disposal facility pursuant to a Contained-In Determination Letter issued by NYSDEC or it would be treated under a permit from New York City Department of Environmental Protection (NYCDEP) and potentially a State Pollutant Discharge Elimination System (SPDES) permit issued by NYSDEC to meet pretreatment requirements prior to discharge to the storm sewer system. Depending on the

withdrawal amount, a Long Island Well Permit will also need to be approved and issued by NYSDEC before any dewatering activities.

A Qualified Environmental Professional (QEP) under the supervision of the Remedial Engineer will be on-Site during all excavation activities to supervise the excavation, document the fieldwork and provide progress report(s) and to ensure the proper implementation of the CAMP. All soil that is excavated will be visually examined by the QEP for the presence of visual/olfactory evidence of contamination. Additionally, select soil samples will be screened for the presence of organic vapors utilizing a Photoionization Detector (PID). A map of Site excavation for development is provided in Figure 4.

Material excavation at the Site will be conducted in a manner that protects the integrity of the adjacent structures using traditional SOEs methods and standard excavation equipment such as track-mounted excavators and backhoes. If underground storage tanks (USTs) and/or their associated piping, and subsurface utilities and their piping are encountered, the excavation will be performed by hand, as required, to safely expose these structures. In the case of USTs, the NYSDEC Project manager will be notified, and the USTs will be closed and removed in accordance with DER-10, NYSDEC PBS regulations and NYC Fire Department regulations.

A total of approximately 8,400 tons (5,600 cubic yards) soil/fill material will be excavated at the Site and disposed of at permitted facilities in accordance with all Federal, State laws and regulations for handling, transport, and disposal. The soil is expected to be disposed of as non-hazardous material pursuant to a Contained-In Determination Letter issued by NYSDEC. Final volumes for all waste(s) or soil that is disposed of will be provided in the FER in the form of waste manifests.

5.1 Soil Cleanup Objectives

The Soil Cleanup Objectives (SCOs) for this Site are listed in Table 1 for Track 1 UUSCOs, in Table 2 for Track 2 RRSCOs and PGWSCOs, and in Table 3 for Track 4 RRSCOs.

Soil and materials management on-Site and off-Site will be conducted in accordance with the Soil/Materials Management Plan as described below.

Table 4 summarizes all soil samples that exceed the SCOs proposed for this Remedial Action. Spider maps that show all soil samples that exceed the SCOs proposed for this Remedial Action are shown in Figure 8 (8A to 8D).

UST closures will, at a minimum, conform to criteria defined in DER-10.

5.2 Remedial Performance Evaluation (Post Excavation End-point Sampling)

Soil removal actions under this plan will be performed in conjunction with confirmation post excavation end-point soil sampling in order to verify the remedial goal has been achieved. Confirmation samples and testing will be performed promptly following materials removal and completed prior to import of backfill material. End-point samples will be collected in accordance with DER-10 and with the QAPP in Appendix G and consistent with the NYSDEC Bureau of Spill Prevention & Response Sampling Guidelines and Protocols, March 1991, NYSDEC CP-51/Soil Cleanup Guidance (October 2010) and NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, May 2010.

5.2.1 End-Point Sampling Frequency

General requirements of the NYSDEC DER-10 mandate sampling for every 30 linear feet of each sidewall and bottom sampling for every 900 square feet of bottom of excavation pit for excavations with up to 300 feet of perimeter sidewall. A reduction of sampling frequency is allowed for excavations exceeding 300 feet of perimeter sidewall. Based on the soil data reported in the February 2026 RIR and consistent with the extent of soil excavation at the Site, a total of twenty-eight (28) end-point samples shall be collected from the Site; including twelve (12) bottom samples designated EP-B-1 to EP-B-12, and sixteen (16) sidewall samples designated EP-W-1 to EP-W-16. Of these samples, one bottom sample EP-B-1 four sidewall samples to be collected in the area of VOCs and metals hotspot in the northern portion of the open rear yard and one bottom sample EP-B-8 to be collected in the VOCs hotspot in the central portion of the partial basement. Prior to sample collection, all visual contamination at the Site will be over excavated to ensure a complete remediation.

Since the Site may potentially achieve a Track 2 SCOs, locations where end-point samples continue to show exceedance of RRSCOs and PGWSCOs will be further excavated to deeper soil and additional confirmation end-point samples will be re-collected beneath that location.

A map of end-point sampling locations is provided in Figure 17.

5.2.2 Methodology

Soil end-point samples will be collected by hand directly from undisturbed soil at bottom of and sidewalls of excavation. Per DER-10, grab VOC samples will be collected from zero to 6 inches at the excavation floor within 24 hours of completing the excavation, or from 6 to 12 inches if collected over 24 hours after completing the excavation. The end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

Each grab end-point sample will be placed into appropriately labeled laboratory containers. New York State ELAP certified labs will be used for all end-point sample analyses. End-point samples will be analyzed for the USEPA target compound list/target analyte list (TCL/TAL) following methodology:

Soil analytical methods will include:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;
- Target Analyte List metals;
- Pesticides/PCBs by EPA Method 8081/8082; and

- Emerging Contaminants:

  *1,4-Dioxane via Method 8270 SIM;

  *21 target Perfluorooctanoic acid (PFOA) via Modified EPA Method 537.

5.2.3 Reporting of Results

Analytical results for the end-point samples will be delivered by the Laboratory as data reports and Analytical Services Protocol (ASP) Category B deliverable packages. A summary of the raw data reports will be provided in a tabular format, and the end-point samples results will be compared to UUSCOS, RRSCOs and PGWSCOs.

5.2.4 QA/QC

All field samplings will be performed in accordance with the QAPP provided in Appendix G. Samples will be properly handled and placed into the appropriate labeled containers. The samples will be placed in a cooler filled with ice and maintained at a maximum 4 degrees Celsius. All samples will be transmitted under proper chain of custody procedures to a State-certified (ELAP) laboratory for confirmatory laboratory analyses. All holding times for each matrix and analysis will be met.

Additionally, trip blanks will be provided with all laboratory transmittals. Matrix Spike and Matrix Spike Duplicate samples will be obtained throughout the sampling at a rate of 1 per 20 samples for each group of analytes.

5.2.5 DUSR and EDDs

A Data Usability Summary Report (DUSR) will be prepared by a third independent party from the laboratory performing the analysis for the verification/ performance of samples collected under this remedial action in accordance with the QAPP and in conformance with the Guidance for the Development of Data Usability Summary Reports as presented in Appendix 2B of DER-10. The DUSRs for all end-point samples data will be included in the FER.

All analytical results for the end-point samples will also be provided in the NYSDEC's electronic data deliverable (EDD) format and submitted via EQuIS™ data processor through NYSDEC's Automated Data Loading System (ADL).

5.2.6 Reporting of End-Point Data in FER

A tabular and map summary of all end-point soil sample results and their highlighted exceedances of SCOs will be reported in the FER.

Chemical labs used for all end-point sample results and contingency sampling will be NYSDOH ELAP certified.

End-point sampling, including bottom and sidewall sampling, will be performed in accordance with DER-10 sample frequency requirements. Sidewall samples will be collected at a minimum of every 30 linear feet. Bottom samples will be collected at a rate of one for every 900 square feet from the base of the remedial excavation. The FER will provide a tabular and map summary of all end-point sample results and exceedances of SCOs.

5.3 Estimated Material Removal Quantities

The estimated quantity of soil/fill to be removed from the Site is 8,400 tons (5,600 cubic yards). The estimated quantity of soil to be imported into the Site for backfill and cover soil is 180 tons 120 cubic yards). The estimated quantity of soil/fill expected to be reused/relocated on Site is 300 tons (200 cubic yards).

5.4 Soil/Materials Management Plan

During Site construction activities, a QEP under the direction of the Remedial Engineer will supervise and monitor the soil/ fill material excavation and document the handling and transport of material removed from the Site for disposal as a regulated solid waste. The QEP will determine whether any excavated material is suitable for direct load-out versus temporary on-Site stockpiling, and the need for additional waste characterization sampling as well as

determining the proper off-Site disposal facility. If needed, separate stockpiles may be generated for the various excavated materials to avoid commingling impacted with non-impacted soil and prevent the mixing of materials destined for disposal at different facilities.

5.4.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed by a qualified environmental professional or experienced field geologist under the direction of the Remedial Engineer during all remedial and development excavations into known or potentially contaminated material. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development phase, such as excavations for foundations and utility work, prior to issuance of the COC.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the FER.

Screening will be performed by qualified environmental professionals. Resumes will be provided for all personnel responsible for field screening (e.g., those representing the Remedial Engineer) of invasive work for unknown contaminant sources during remediation and development work.

5.4.2 Stockpile Methods

Stockpiles of excavated soil/fill material will be constructed as necessary to separate and avoid commingling of materials, to stage material pending loading arrangements, or to conduct additional waste characterization sampling. Soil stockpiles will be subject to the following controls:

- 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 NYSDEC. At a minimum, a storm event should be considered a rainfall of three inches or greater in 12 hours. Judgement should be used to evaluate water infiltration, nearby waterbodies where runoff is likely, and engineering controls that may be affected.
- 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 appropriately graded to control run-off and will be located away from the property boundaries, where practicable.
- Stockpiles will be continuously encircled with silt fences. Hay bales will be used as needed near catch basins, surface waters and other discharge points.
- Exposed stockpiles will be sprayed with a water cannon for dust control, as necessary.

5.4.3 Materials Excavation and Load Out

The Remedial Engineer or a qualified environmental professional under his/her supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this Remedial Action Work Plan 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).

Vehicles leaving the Site will not be overloaded. The Remedial Engineer's representative will make reasonable efforts to ensure that vehicles are not loaded beyond their NYSDOT weight rating and that all material is secured beneath the truck bed cover.

A truck wash will be operated on-Site. The Remedial Engineer will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the remedial construction is complete.

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

The Remedial Engineer will be responsible for ensuring that all egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during Site remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site -derived materials.

The Volunteer and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

The Remedial Engineer will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this Remedial Action Work Plan.

Each hotspot and structure to be remediated (USTs, vaults and associated piping, transformers, etc.) will be removed and end-point remedial performance sampling completed before excavations related to Site development commence proximal to the hotspot or structure.

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation required by this plan.

Mechanical processing of historical fill and contaminated soil on-Site is prohibited.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be reported in the FER.

5.4.4 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.

Truck transport routes are provided in Figure 14. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes. These are the most appropriate routes 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; and (g) community input.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Queuing of trucks will be performed on-Site in order to minimize off-Site disturbance. Off-Site queuing will be prohibited.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas or mesh truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the Site. Truck wash waters will be collected, as necessary, and disposed of off-Site in an appropriate manner.

5.4.5 Materials Disposal Off-Site

The disposal locations will be established at a later date and will be reported to the NYSDEC Project Manager prior to Site excavation.

The total quantity of material expected to be disposed of off-Site is approximately 8,400 tons (5,600 cubic yards) of historic fill, contaminated soil and native material. None of this material is expected to be disposed of as hazardous materials.

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be disposed of in accordance with all local State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.

Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360.15 Registration Facility).

The following documentation will be obtained and reported by the Remedial Engineer for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a letter from the Remedial Engineer or BCP Volunteer to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported (including Site Characterization data); and (2) a letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material. These documents will be included in the FER.

Non-hazardous historic fill and contaminated soils taken off-Site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360.2. The Remedial Engineer is

responsible for assuring material is properly characterized and determining the appropriate disposal methods based on the characterization results.

Historical fill and contaminated soils from the Site are prohibited from being disposed at Part 360.15 Registration Facilities (also known as Soil Recycling Facilities).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the NYSDEC Division of Materials Management (DMM) to be Construction and Demolition (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 processing facility without permit modifications only upon prior notification of NYSDEC DMM. This material is prohibited from being sent or redirected to a Part 360-15 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.

The FER will include an accounting of the destination of all material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will also be presented in a tabular form in the FER.

Bill of Lading system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the FER.

Hazardous waste derived from on-Site will be stored, transported, and disposed of in full compliance with applicable local, State, and Federal regulations.

Appropriately licensed haulers will be used for material removed from this Site and will be in full compliance with all applicable local, State and Federal regulations.

Waste characterization sampling will be performed exclusively for the purposes of off-Site soil disposal in a manner suitable to receiving facilities and in conformance with applicable federal, state and local laws rules and regulations and facility-specific permits. Sampling and analytical methods, sampling frequency, analytical results and QA/QC associated with waste characterization activities will be reported in the FER. All data available for soil/material to be disposed of at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt. Waste characterization data will be used solely for complying with requirements for off-site disposal. Waste Characterization sampling cannot be utilized for:

- Delineating the extent of contamination required for remediation at a Site.
- Replacing or substituting data collected as part of Site Characterization and/or Remedial Investigation.
- Replacing or substituting confirmation or documentation sampling as described in NYSDEC DER-10, Section 5.4.
- To modify remedial decisions as formalized in a NYSDEC approved Decision Document or Record of Decision.

5.4.6 Materials Reuse On-Site

Re-use of on-Site clean native soil will only be allowed if the material is found to meet the lower of Protection of Groundwater SCOs or Restricted Residential Use SCOs. A formal request with sample collection, analytical results, volumes, and appropriate plans depicting the location of proposed excavation of soil/fill and reuse destination will be submitted to NYSDEC for review and approval consistent with the requirements outlined in Section 5.4.5 for clean soil removed for development purposes.

The Remedial Engineer will ensure that procedures defined for materials reused in this RAWP are followed and that unacceptable material will not remain on-Site. This criterion is listed in Table 2 for RRSCOs and PGWSCOs.

A “Request to Import/Reuse Fill Material” form will be filed with the NYSDEC project manager for review and approval prior to material reuse on the Site. A copy of the form is presented in Appendix J. Acceptable demolition material proposed for reuse on-Site, if any, will be sampled for asbestos.

Concrete crushing or processing on-Site is prohibited, unless NYSDEC has specifically approved on-site processing and reuse of acceptable demolition material.

Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site is prohibited for reuse on-Site.

Contaminated on-Site material, including historic fill and contaminated soil, removed for grading or other purposes will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. This will be expressed in the Site Management Plan (SMP).

5.4.7 Fluids Management

Since groundwater might be encountered during the excavation for the elevator pit at the depth of 23 ft bgs, dewatering activities may be necessary. Since dewatering activities will be implemented as a part of the RAWP, they will be certified by the Remedial Engineer.

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP.

Dewatered fluids will not be recharged back to the land surface or subsurface of the Site. Dewatering fluids will be managed off-Site.

Discharge of water generated during remedial construction to surface waters (i.e. a local pond, stream, river and/or storm sewer) is prohibited without a SPDES permit.

5.4.8 Demarcation

After the completion of soil removal and any other invasive remedial activities and prior to backfilling, a land survey will be performed by a New York State licensed surveyor. The survey will define the top elevation of residual contaminated soils. A physical demarcation layer, consisting of orange snow fencing material or equivalent material will be placed on this surface to provide a visual reference. This demarcation layer will constitute the top of the 'Residuals Management Zone', the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the SMP. The survey will measure the grade covered by the demarcation layer before the placement of cover soils, pavement and sub-soils, structures, or other materials. This survey and the demarcation layer placed on this grade surface will constitute the physical and written record of the upper surface of the 'Residuals Management Zone' in the SMP. A map showing the survey results will be included in the FER and the SMP.

5.4.9 Backfill from Off-Site Sources

All materials proposed for import onto the Site will be approved by the Remedial Engineer and will be in compliance with provisions in this RAWP prior to receipt at the Site.

Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site. Solid waste will not be imported onto the Site.

The FER will include the following certification by the Remedial Engineer: "I certify that all import of soils from off-Site, including source evaluation, approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan".

All imported soils will meet NYSDEC approved backfill or cover soil quality objectives for this Site. These NYSDEC approved backfill or cover soil quality objectives are the lower of the protection of groundwater or the protection of public health soil cleanup objectives for Restricted Residential Use as set forth in Table 375-6.8(b) of 6 NYCRR Part 375 and listed in Tables 2. Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC.

Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose.

Soil that meets 'general fill' requirements under 6 NYCRR Part 360.13, but does not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Nothing in this RAWP should be construed as an approval for this purpose.

A "Request to Import/Reuse Fill Material" form will be filed with the NYSDEC project manager for review and approval prior to import to the site. A copy of the form is presented in Appendix J.

5.4.10 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by 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 RAWP 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 remedial construction area.

5.4.11 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation or development related construction, sampling will be performed on product, sediment and surrounding soils, etc. in accordance with DER-10. Chemical analytical work will be for full scan parameters (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides, PCBs and PFAS). Analyses will not be otherwise limited without NYSDEC approval.

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. These findings will be also included in daily and periodic electronic media reports.

5.4.11.1 Extreme Storm Preparedness and Response Contingency Plan

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of Site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous Site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the Volunteer will undertake the following steps for Site preparedness prior to the event and response after the event.

Storm Preparedness

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from excavated areas, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the Site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and

fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A Site inspection report will be submitted to NYSDEC at the completion of Site inspection and after the Site security is assessed. Site conditions will be compared to the inventory of Site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911.

Petroleum spills will be reported to NYSDEC within 2 hours of identification and consistent with State regulations. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed.

Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Stormwater control systems and structures will be inspected and maintained as necessary.

If soil or fill materials are discharged off -Site to adjacent properties, property owners and NYSDEC will be notified, and corrective measure plan designed to remove and clean dislocated material will be submitted to NYSDEC and implemented following approval by NYSDEC and granting of Site access by the property owner. Impacted off-Site areas may require characterization based on Site conditions, at the discretion of NYSDEC.

If on-Site petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYSDEC's spill hotline at (800) 457-7362 within statutory defined timelines. If the source of the spill is ongoing and can be

identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYSDEC.

Storm Response Reporting

A Site inspection report will be submitted to NYSDEC at the completion of Site inspection. An inspection report will be used for this purpose. Site conditions will be compared to the inventory of Site conditions and material performed prior to the storm event and significant differences will be noted. The Site inspection report will be sent to the NYSDEC project manager and will include the Site name, address, tax block and lot, Site primary and alternate contact name and phone number.

Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the Site was dislocated and whether any of the soil left the Site; estimates of the volume of soil that left the Site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of on-Site or off-Site exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYSDEC; description of corrective actions; schedule for corrective actions.

This report should be completed and submitted to NYSDEC project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.4.12 Community Air Monitoring Plan

The CAMP has been prepared to monitor air quality during ground intrusive activities at the Site, which include but are not limited to soil excavation, lagging and installation of concrete foundations. The CAMP will include Aethair® air quality monitors with Environet web-based environmental data management platform that is capable of recording real-time air quality monitoring data and calculating 15-minute averages. Air quality monitoring will include monitoring the air for organic vapors using a PID and the presence of elevated levels of dust using Particulate Dust Track Real-time Particle Counter. Exceedances observed in the CAMP

will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report. A CAMP is provided under Appendix H.

Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report.

5.4.13 Odor, Dust and Nuisance Control Plan

The FER will include the following certification by the Remedial Engineer: "I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan."

5.4.13.1 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 spraying of an odor-suppressing agent, brand name Biosolve, and if necessary, covering the source of odor with a tarp. If nuisance odors are identified, 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 all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Volunteer's Remedial Engineer, who is responsible for certifying the FER.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using foam to cover exposed odorous soils; [add other elements as appropriate]. 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.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/ filtering systems.

5.4.13.2 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 through the use of water that will be available at the Site from a south-adjacent fire hydrant. Water from the fire hydrant is readily pressurized and it will be sprayed 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 spraying.

5.4.13.3 Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work and will conform, at a minimum, to NYCDEP noise control standards.

5.4.14 Groundwater remediation

The residual dissolved gasoline VOCs associated with the former closed NYSDEC Spill #9711128 will be treated in-situ in the vicinity of monitoring wells MW-4a and MW-7 located in the southern portion of the Site via bioremediation mechanism. A bioremedial agent identified as Oxygen Releasing Compound Advanced (ORCA) will be injected into the subsurface to destroy the contaminants in an approximately 1,125 square foot area. According to manufacturer's recommendations that are based on their review of RI groundwater data, a total of 960 pounds of ORCA mixed with 268.4 gallons of water will be applied via 11 injection points designated i-1 to i-11 for a target radius influence of 5 feet around each point. Injections design plan is shown in Figure 18. The solution will be injected under pressure approximately 12 feet below the soil/groundwater interface to a depth of approximately 35 feet bgs. The scope of these remedial injections will commence prior or during Site excavation. Appendix K provides a design summary of in-situ groundwater treatment.

Documentation of in-situ groundwater treatment applications will be reported to NYSDEC via daily and monthly reports and also presented in the FER.

5.4.15 Groundwater Monitoring

Following remedial injections, groundwater samples will be collected from three existing monitoring wells MW-4a, MW-5a and MW-7 located in the vicinity of the treatment area to determine the effectiveness of the remedy and document groundwater quality at the Site. Three groundwater samples plus QA/QC samples, will be collected and analyzed for VOCs quarterly for a minimum of two years after treatment. Groundwater monitoring will be included in the SMP and is anticipated that groundwater monitored natural attenuation (MNA) will take place following the 2-year period after injections. Figure 15 provides a map with the locations of the three monitoring wells MW-4a, MW-5a and MW-7.

6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

Since residual contaminated soil, groundwater, and soil vapor will exist beneath the Site after the Track 4 remedy is complete, Engineering and Institutional Controls (ECs and ICs) are required to protect human health and the environment. These ECs and ICs are described hereafter. Long-term management of EC/ICs and of residual contamination will be executed under a Site-specific Site Management Plan (SMP) that will be developed and included in the FER.

ECs will be implemented to protect public health and the environment by appropriately managing residual contamination. The Controlled Property (the Site) will have two primary EC systems. These are: an active SSDS under a Track 2 and a Track 4 remedy, and a contingent site cover system under a Track 4 remedy.

The FER will report residual contamination on the Site in tabular and map form. This will include presentations of exceedances of USCOs, RRSCOs and PGWSCOs.

7.0 ENGINEERING CONTROLS

This project is scheduled to achieve a Track 4 remedy with a contingent Track 2 remedy across any area where residual soil continues to exceed RRSCOs for Track 4 cleanup, or RRSCOs and PGWSCOs for a Track 2 cleanup based on documentation sampling results. As such, Engineering Controls are required under both the Track 2 and Track 4 remedies and will consist of the following.

7.1 Site Cover System

Under the Track 4 remedy, exposure to residual contaminated soils will be prevented by an engineered Site cover system that will be built on the Site and will be subject to the SMP. If Track 4 cleanup is upgraded to Track 2 remedy after Site remediation is complete, the composite cover system will then be considered a construction element and it would not function as an EC. This Site cover system will be comprised of 6-inch thick concrete slab on-grade and a 12-inch thick concrete basement slab underlain by compacted bluestone and 6-inch thick concrete slab in open year yard.

Green remediation BMPs for designing and installing a conventional cover system include:

- Design in ways that mimic rather than alter the Site's natural setting, to improve the cover's long-term performance and protect ecosystem services such as potable water, wildlife habitat, and carbon storage;
- Design a cover accounting for potential effects of climate change, which could involve changes in on-Site soil development or increased vulnerability to flooding;
- Use uncontaminated soil or sediment from on-Site excavation instead of imported soil/sediment for the cover's frost prevention and erosion control layers; similarly, uncontaminated sand, gravel, and rocks from on-Site instead of off-Site areas may be used for drainage;
- Apply low impact development strategies such as installing earthen berms to manage stormwater;
- Choose geotextile fabric or drainage tubing composed of 100% recycled materials rather than virgin materials for lining, erosion control, and drainage;
- Select materials with biobased content for daily activities during cover construction;

- Use clean fuel and emission control technologies for routine field vehicles and machinery such as backhoe and bulldozers to reduce fuel consumption and emission of air pollutants such as GHGs and particulate matter; and
- Investigate on-Site solar and wind resources to power equipment such as leachate pumps and flare units.

For alternative cover designs

- Substitute concrete with high albedo pavement, which reflects sunlight and heat away from the cover surface and may aid growth of nearby vegetation; and
- Consider using concrete containing a high percentage of industrial waste by-products as a substitute for cement, if tests show no contaminant leaching.

In addition to BMPs that apply to conventional covers, BMPs for designing and installing an ET cover include:

- Choose recycled (crushed) concrete for bio-barriers or capillary breaks instead of natural rock;
- Select native drought-resistant plants for the upper vegetative layer to reduce maintenance needs;
- Preserve biodiversity and related ecosystem services by installing a suitable mix of native shrubs, grasses, and forbs; and
- Use non-synthetic amendments such as compost instead of chemical fertilizers if the soil or vegetation is found to need supplementation over time.

A diagram showing the design detail for each cover type is shown in Figure 19.

An Excavation Plan will be included in the Site Management Plan and will outline the procedures to be followed if the Site cover system and underlying residual contamination are disturbed after the Remedial Action is complete.

The components of the Site cover system will be documented in the FER. Maintenance of this Site cover system will be described in the SMP.

7.2 Engineering Controls: Treatment Systems

Petroleum and chlorinated compounds detected in soil vapors during the RI will be addressed by an active sub-slab depressurization system (SSDS). The SSDS will mitigate potential soil

vapor intrusion from any remaining on-Site or off-Site contaminant source by creating a negative pressure below the building via a network of linear suction pipes installed beneath the building slabs system. The under-slab suction pipes will be connected to a suction blower mounted on the roof of the building.

The suction pipes beneath building slabs will consist of 4" diameter Schedule-40 perforated PVC pipes (hole size of ½", hole spacing of 5±1/4", 2-hole rows spaced 120º). These perforated pipes will be installed within a 6"-thick layer of porous aggregates composed of ¾" bluestone furnished immediately under the slab. The horizontal network of perforated pipes will be connected to a 4" diameter cast iron riser pipe (riser pipe must meet the NYC mechanical code MC-512 sub-slab exhaust systems) that will traverse the 12-story building interior through a vertical shaft all the way to the roof line. Alternatively, the riser pipe can also be installed on the exterior building façade following approval by the building design team. The riser will be connected above the roof line to a GAST 1Horsepower (HP) explosion proof regenerative blower Model R4310P-50. This blower has a 230V single phase power requirement of 60 Hz and is capable of generating maximum negative pressure of 48 inch-WC and a maximum air flow rate of 92 cubic feet per minute (CFM).

The blower system will be permanently mounted on the roof of the building. It will be enclosed inside a soundproof enclosure that is about 62" High, 54" Long, 34" wide and will be equipped with a 35-gallon liquid knockout drum to allow condensation liquid phase removal prior to airflow reaching the blower. A telemetry system will also be connected to the blower system, which would trigger an automatic phone call with future building management in case the blower malfunctions or the blower suction pressure is lost. The effluent from blower will be connected to a vapor phase granulated activated carbon vessel to treat air prior to the discharge point.

As part of the specifications of the SSDS installation and operation, a total of seven (7) sub-slab pressure test points designated as PT-1 to PT-7 will be installed in the slabs of the partial basement and the on-grade portions of the building. Each pressure test point will consist of a stainless-steel screen placed beneath the slabs and will be fitted individually with inert tubing (e.g., polyethylene) of ¼ inch diameter terminating above the slab with a gas tight fitting and a limited access manhole cover. The polyethylene tubing of each sub-slab pressure test point will

be properly sealed with the installed vapor barrier under the building slabs. The purpose of these test points is to provide a quantitative pressure field extension testing after SSDS start-up. The final locations of the vacuum monitoring points, location of riser pipe, blower, and vent will be subject to approval by the building design team as well as NYSDEC and this installation shall be reflected in NYS PE-certified as-built drawings in the FER.

Design plans showing the SSDS system are shown in Figure 20 (20A to 20F). SSDS design specifications and material specifications cut sheets are provided under in Appendix L.

8.0 CRITERIA FOR COMPLETION OF REMEDIATION/TERMINATION OF REMEDIAL SYSTEMS

8.1 Composite Cover System

The composite cover system is a permanent control, and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity. The frequency of inspections will be defined in the SMP that will be prepared prior to the issuance of COC. Maintenance of this composite cover system will also be described in the SMP. A Soil and Materials Management Plan will be included in the SMP and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete.

8.2 Sub-slab Depressurization System (SSDS)

The active SSDS will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the active SSDS may be submitted by the property owner based on confirmatory data that justifies such request. Systems will remain in place and operational until permission to discontinue use is granted in writing by NYSDEC and NYSDOH.

8.2.1 Post SSDS Start-Up Indoor Air Assessment

Following SSDS Start-up prior to building occupancy, an SSDS Efficacy Sampling Work Plan will be submitted to NYSDEC for approval. This plan will involve on-Site indoor air assessment to evaluate the effectiveness of the active vapor mitigation system and verify that no potential soil vapor intrusion is impacting indoor air quality of the new building at the Site. This post-mitigation sampling will be conducted at least 30 days after system startup, and it will be reported in the FER. If the indoor air sampling is performed outside of the heating season, a second round of post-mitigation air sampling will be conducted during the next heating season after system startup. If this latter sampling is outlined in the SMP, it will be documented as part of Site management activities following the issuance of the COC.

8.3 Groundwater Monitoring

Groundwater monitoring activities to assess the performance of the remedy, or natural attenuation following the removal of contaminant sources, will continue, as determined by NYSDOH and NYSDEC, until residual groundwater concentrations are found to be below NYSDEC standards or have become asymptotic over an extended period. Monitoring will continue until permission to discontinue is granted in writing by NYSDEC and NYSDOH. Monitoring activities will be outlined in the Monitoring Plan of the SMP. It is anticipated that, following remediation, a minimum of eight quarterly monitoring events will be performed.

9.0 INSTITUTIONAL CONTROLS

After the remedy is complete, the Site will have residual contamination remaining in place. Engineering Controls (ECs) for the residual contamination have been incorporated into the remedy to render the overall Site remedy protective of public health and the environment. Two elements have been designed to ensure continual and proper management of residual contamination in perpetuity: an Environmental Easement and a Site Management Plan (SMP).

All as-built drawings, diagrams, calculation and manufacturer documentation for treatment systems will be presented in the FER. A Site -specific Environmental Easement will be recorded with Bronx County to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all Engineering and Institutional Controls (ECs/ICs) placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. The SMP describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

9.1 Environmental Easement

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination is left on-Site after the Remedial Action is complete. As part of this remedy, an Environmental Easement approved by NYSDEC will be filed and recorded with the Bronx County Office of the City Register. The Environmental Easement will be submitted as part of the Final Engineering Report.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement must be recorded with Bronx County before the Certificate of Completion can be issued by NYSDEC. A series of Institutional Controls are required under this remedy to implement, maintain and monitor these Engineering Control systems, prevent future exposure to

residual contamination by controlling disturbances of the subsurface soil and restricting the use of the Site to Restricted Residential, commercial and industrial use(s) only. These Institutional Controls are requirements or restrictions placed on the Site that are listed in, and required by, the Environmental Easement. Institutional Controls can, generally, be subdivided between controls that support Engineering Controls, and those that place general restrictions on Site usage or other requirements. Institutional Controls in both of these groups are closely integrated with the SMP, which provides all of the methods and procedures to be followed to comply with this remedy.

The Institutional Controls that support Engineering Controls are:

- Compliance with the Environmental Easement by the Grantee and the Grantee's successors and adherence of all elements of the SMP is required;
- All Engineering Controls must be operated and maintained as specified in this SMP;
- A site cover system consisting of asphalt covered roads, concrete covered sidewalks, and concrete building slabs must be inspected, certified and maintained as required in the SMP;
- A soil vapor mitigation system consisting of a sub-slab depressurization system under all building structures must be inspected, certified, operated and maintained as required by the SMP;
- All Engineering Controls on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP;
- Groundwater, soil vapor, and other environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP;
- On-Site environmental monitoring devices, including but not limited to, [groundwater monitor wells and soil vapor probes], must be protected and replaced as necessary to ensure proper functioning in the manner specified in the SMP;
- Engineering Controls may not be discontinued without an amendment or extinguishment of the Environmental Easement.

Adherence to these Institutional Controls for the Site is mandated by the Environmental Easement and will be implemented under the SMP (discussed in the next section). The Controlled Property (Site) will also have a series of Institutional Controls in the form of Site restrictions and requirements. The Site restrictions that apply to the Controlled Property are:

- Vegetable gardens and farming on the Controlled Property are prohibited;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Controlled Property that will disturb residual contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;
- The Controlled Property may be used for restricted residential, commercial, and industrial uses use only, provided the long-term Engineering and Institutional Controls included in the SMP are employed;
- The Controlled Property may not be used for a higher level of use, without an amendment or extinguishment of this Environmental Easement;
- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This annual statement must be certified by an expert that the NYSDEC finds acceptable.

9.2 Site Management Plan

Site Management is the last phase of remediation and begins with the approval of the FER and issuance of the Certificate of Completion (COC) for the Remedial Action. The SMP is submitted as part of the FER but will be written in a manner that allows its removal and use as a complete and independent document. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the SMP are performed.

The SMP should include methods to incorporate and track GSR. Measures should be taken to maintain a cost-effective, protective remedy that remains conscientious of the Site's environmental footprint. At a minimum, the following should be assessed: waste generation, energy usage, emissions, and water usage.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual); (4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (5) defining criteria for termination of treatment system operation.

To address these needs, this SMP will include four plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems; and (4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annually. The SMP will be based on the certifying period relative to the date of issuance of the COC. The first submission will be due 16 months after the issuance of the COC, and annually (or at another frequency as approved by NYSDEC) thereafter.

No exclusions for handling of residual contaminated soils will be provided in the SMP. All handling of residual contaminated material will be subject to provisions contained in the SMP.

10.0 FINAL ENGINEERING REPORT

A Final Engineering Report (FER) will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides the documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The Final Engineering Report will include as-built drawings for all constructed elements, calculation and manufacturer documentation for treatment systems, certifications, manifests, bills of lading as well as the complete SMP. The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP and associated design documents. The FER will provide a tabular summary of all performance evaluation sampling results and all material characterization results and other sampling, and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The FER will be prepared in conformance with DER-10.

Where determined to be necessary by NYSDEC, a Financial Assurance Plan will be required to ensure the sufficiency of revenue to perform long-term operations, maintenance and monitoring tasks defined in the Site Management Plan and Environmental Easement. This determination will be made by NYSDEC in the context of the FER review.

The FER will include written and photographic documentation of all remedial work performed under this remedy.

The FER will include an itemized tabular description of actual costs incurred during all aspects of the Remedial Action.

The FER will provide a thorough summary of all residual contamination left on the Site after the remedy is complete. Residual contamination includes all contamination that exceeds the Track 4 RRSCO in 6NYCRR Part 375-6. A table that shows exceedances from Track 4 RRSCOs for all soil/fill remaining at the Site after the Remedial Action and a map that shows the location

and summarizes exceedances from Track 4 RRSCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

The FER will provide a thorough summary of all residual contamination that exceeds the SCOs defined for the Site in the RAWP and must provide an explanation for why the material was not removed as part of the Remedial Action. A table that shows residual contamination in excess of Site SCOs and a map that shows residual contamination in excess of Site SCOs will be included in the FER.

The FER will include an accounting of the destination of all material removed from the Site, including excavated contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the Site.

The FER must include a discussion of the green remediation practices/technologies employed throughout the remedial program. A final footprint analysis using a DER accepted model, and any tracking methods used through the construction including restoration activities. Before approval of a FER and issuance of a COC, all project reports must be submitted in digital form on electronic media (PDF).

10.1 Certifications

The following certification will appear in front of the Executive Summary of the Final Engineering Report. The FER will be prepared, stamped and the following certification signed by an individual licensed or otherwise authorized in accordance with article 145 of the education law to practice the profession of engineering. The certification will include the following statements:

I, Tarek Z. Khouri, am currently a registered professional engineer licensed by the State of New York, I had primary direct responsibility for implementation of the remedial program activities, and I certify that the Remedial Action Work Plan was implemented and that all

construction activities were completed in substantial conformance with the Department-approved Remedial Action Work Plan.

I certify that the data submitted to the Department with this Final Engineering Report demonstrates that the remediation requirements set forth in the [Remedial Action Work Plan or Remedial Design] and in all applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, established for the remedy.

I certify that all use restrictions, Institutional Controls, Engineering Controls, and/or any operation and maintenance requirements applicable to the Site are contained in an environmental easement created and recorded pursuant ECL 71-3605 and that all affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded.

I certify that a Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by Department.

I certify that all data generated in support of this report have been submitted in accordance with the Department's electronic data deliverable and have been accepted by the Department.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Tarek Z. Khouri, of HydroTech Environmental Engineering and Geology, DPC, am certifying as Owner's Designated Site Representative and I have been authorized and designated by all Site owners to sign this certification for the Site.

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

11.0 SCHEDULE

Implementation of the Track 4 remedial activities is anticipated to take approximately 18 months. After the completion of all remedial activities at the Site, a Site management Plan (SMP) and a Final Engineering Report (FER) will be submitted to NYSDEC as detailed in Section 9.2 and Section 10.0. The SMP will be implemented following the issuance of a Certificate of Completion, which is anticipated during December 2027. A chart showing a detailed project schedule is included in Appendix M.

TABLES

Table 1
Track 1 Soil Cleanup Objectives
3083 Webster Avenue, Bronx, NY

CONTAMINANTS	UUSCOs
VOCs	
1,1,1-Trichloroethane	0.68
1,1-Dichloroethane	0.27
1,1-Dichloroethylene	0.24
1,2,4-Trimethylbenzene	5.9
1,2-Dichlorobenzene	1.1
1,2-Dichloroethane	0.02
1,3,5-Trimethylbenzene	3.1
1,3-Dichlorobenzene	2.6
1,4-Dichlorobenzene	1.8
1,4-Dioxane	0.1
2-Butanone	0.10
Acetone	0.03
Benzene	0.06
Carbon tetrachloride	0.76
Chlorobenzene	4.5
Chloroform	0.37
cis-1,2-Dichloroethylene	0.19
Ethyl Benzene	1
Methyl tert-butyl ether (MTBE)	0.10
Methylene chloride	0.05
n-Butylbenzene	18
n-Propylbenzene	5
o-Xylene	0.26
p- & m- Xylenes	0.26
sec-Butylbenzene	25
tert-Butylbenzene	11
Tetrachloroethylene	1.3
Toluene	0.7
trans-1,2-Dichloroethylene	0.19
Trichloroethylene	0.47
Vinyl Chloride	0.03
Xylenes, Total	0.26
SVOCs	
1,2-Dichlorobenzene	1.1
1,3-Dichlorobenzene	2.6
1,4-Dichlorobenzene	1.8
1,4-Dioxane	0.1
2-Methylphenol	0.33
3- & 4-Methylphenols	0.33
Anthracene	100
Benzo(a)anthracene	1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1
Benzo(g,h,i)perylene	0.64
Benzo(k)fluoranthene	0.8
Chrysene	1
Dibenzo(a,h)anthracene	0.33
Dibenzofuran	2.1
Fluoranthene	85
Fluorene	30
Hexachlorobenzene	0.33
Indeno(1,2,3-cd)pyrene	0.5
Naphthalene	12
Nitrobenzene	0.08
Pentachlorophenol	0.8
Phenanthrene	1.1
Phenol	0.33
Pesticides	

CONTAMINANTS	UUSCOs
Pesticides	
4,4'-DDD	0.0033
4,4'-DDE	0.0033
4,4'-DDT	0.0033
Aldrin	0.0048
alpha-BHC	0.02
alpha-Chlordane	0.014
beta-BHC	0.021
delta-BHC	0.04
Dieldrin	0.005
Endosulfan I	4.3
Endosulfan II	4.3
Endosulfan sulfate	4.3
Endrin	0.014
gamma-BHC (Lindane)	0.025
Heptachlor	0.013
Metals	
Arsenic	13
Barium	410
Beryllium	4.4
Cadmium	2.5
Chromium, Hexavalent	1
ChromiumTrivalent	30
Copper	50
Lead	63
Manganese	1,600
Mercury	0.18
Nickel	30
Selenium	3.9
Silver	2
Zinc	109
PCBs	
Total PCBs	0.1
PFAs	
Perfluorooctanesulfonic acid (PFOS)	0.00088
Perfluorooctanoic acid (PFOA)	0.0066

UUSCOS=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
All standards are in milligram per kilogram (mg/kg)

Table 1
Track 2 Soil Cleanup Objectives
3083 Webster Avenue, Bronx, NY

CONTAMINANTS	RRSCOs	PGWSCOs
VOCs		
1,1,1-Trichloroethane	100	0.68
1,1-Dichloroethane	47	0.27
1,1-Dichloroethylene	0.98	0.33
1,2,4-Trimethylbenzene	100	5.9
1,2-Dichlorobenzene	100	1.1
1,2-Dichloroethane	5.8	0.02
1,3,5-Trimethylbenzene	100	3.1
1,3-Dichlorobenzene	38	2.6
1,4-Dichlorobenzene	24	1.8
1,4-Dioxane	5.7	0.1
2-Butanone	100	0.10
Acetone	100	0.03
Benzene	3.7	0.06
Carbon tetrachloride	7.1	0.76
Chlorobenzene	100	4.5
Chloroform	24	0.37
cis-1,2-Dichloroethylene	41	0.19
Ethyl Benzene	76	1
Methyl tert-butyl ether (MTBE)	100	0.1
Methylene chloride	81	0.05
n-Butylbenzene	100	18
n-Propylbenzene	100	5
o-Xylene	100	1.2
p- & m- Xylenes	100	1.2
sec-Butylbenzene	100	25
tert-Butylbenzene	100	11
Tetrachloroethylene	18	1.3
Toluene	100	0.7
trans-1,2-Dichloroethylene	100	0.19
Trichloroethylene	6.4	0.47
Vinyl Chloride	0.48	0.03
Xylenes, Total	100	1.2
SVOCs		
1,2-Dichlorobenzene	100	1.1
1,3-Dichlorobenzene	38	2.6
1,4-Dichlorobenzene	24	1.8
1,4-Dioxane	5.7	0.1
2-Methylphenol	100	0.33
3- & 4-Methylphenols	100	0.33
Anthracene	100	1,000
Benzo(a)anthracene	1.4	1
Benzo(a)pyrene	1	22
Benzo(b)fluoranthene	1.4	2.1
Benzo(g,h,i)perylene	4.9	1,000
Benzo(k)fluoranthene	4.9	2
Chrysene	4.9	1
Dibenzo(a,h)anthracene	0.33	1,000
Dibenzofuran	18	110
Fluoranthene	100	1,000
Fluorene	100	386
Hexachlorobenzene	0.33	3.2
Indeno(1,2,3-cd)pyrene	1.4	6.6
Naphthalene	100	12
Nitrobenzene	1.8	0.08
Pentachlorophenol	1.3	0.8
Phenanthrene	4.9	1,000
Phenol	100	0.33
Pyrene	100	1,000

CONTAMINANTS	RRSCOs	PGWSCOs
Pesticides		
4,4'-DDD	5	14
4,4'-DDE	3.4	9.3
4,4'-DDT	3.8	135
Aldrin	0.044	0.19
alpha-BHC	0.18	0.02
alpha-Chlordane	0.65	4.5
beta-BHC	0.18	0.09
delta-BHC	100	0.1
Dieldrin	0.075	0.1
Endosulfan I	35	65
Endosulfan II	35	44
Endosulfan sulfate	35	47
Endrin	5.3	0.06
gamma-BHC (Lindane)	0.21	0.05
Heptachlor	0.53	0.38
Metals		
Arsenic	16	16
Barium	410	820
Beryllium	43	47
Cadmium	2.5	7.5
Chromium, Hexavalent	1.0	19
ChromiumTrivalent	110	NS
Copper	280	1,720
Lead	400	450
Manganese	2,000	2,000
Mercury	0.30	0.73
Nickel	320	130
Selenium	110	4
Silver	110	8.3
Zinc	6,600	2,480
PCBs		
Total PCBs	1	3.2
PFAs		
Perfluorooctanesulfonic acid (PFOS)	0.044	0.001
Perfluorooctanoic acid (PFOA)	0.033	0.0008

RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCO=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater
All standards are in milligram per kilogram (mg/kg)

Table 3
Track 4 Soil Cleanup Objectives
3083 Webster Avenue, Bronx, NY

CONTAMINANTS	RRSCOs
VOCs	
1,1,1-Trichloroethane	100
1,1-Dichloroethane	47
1,1-Dichloroethylene	0.98
1,2,4-Trimethylbenzene	100
1,2-Dichlorobenzene	100
1,2-Dichloroethane	5.8
1,3,5-Trimethylbenzene	100
1,3-Dichlorobenzene	38
1,4-Dichlorobenzene	24
1,4-Dioxane	5.7
2-Butanone	100
Acetone	100
Benzene	3.7
Carbon tetrachloride	7.1
Chlorobenzene	100
Chloroform	24
cis-1,2-Dichloroethylene	41
Ethyl Benzene	76
Methyl tert-butyl ether (MTBE)	100
Methylene chloride	81
n-Butylbenzene	100
n-Propylbenzene	100
o-Xylene	100
p- & m- Xylenes	100
sec-Butylbenzene	100
tert-Butylbenzene	100
Tetrachloroethylene	18
Toluene	100
trans-1,2-Dichloroethylene	100
Trichloroethylene	6.4
Vinyl Chloride	0.48
Xylenes, Total	100
SVOCs	
1,2-Dichlorobenzene	100
1,3-Dichlorobenzene	38
1,4-Dichlorobenzene	24
1,4-Dioxane	5.7
2-Methylphenol	100
3- & 4-Methylphenols	100
Anthracene	100
Benzo(a)anthracene	1.4
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1.4
Benzo(g,h,i)perylene	4.9
Benzo(k)fluoranthene	4.9
Chrysene	4.9
Dibenzo(a,h)anthracene	0.33
Dibenzofuran	18
Fluoranthene	100
Fluorene	100
Hexachlorobenzene	0.33
Indeno(1,2,3-cd)pyrene	1.4
Naphthalene	100
Nitrobenzene	1.8
Pentachlorophenol	1.3
Phenanthrene	4.9
Phenol	100
Pyrene	100

CONTAMINANTS	RRSCOs
Pesticides	
4,4'-DDD	5
4,4'-DDE	3.4
4,4'-DDT	3.8
Aldrin	0.044
alpha-BHC	0.18
alpha-Chlordane	0.65
beta-BHC	0.18
delta-BHC	100
Dieldrin	0.075
Endosulfan I	35
Endosulfan II	35
Endosulfan sulfate	35
Endrin	5.3
gamma-BHC (Lindane)	0.21
Heptachlor	0.53
Metals	
Arsenic	16
Barium	410
Beryllium	43
Cadmium	2.5
Chromium, Hexavalent	1.0
ChromiumTrivalent	110
Copper	280
Lead	400
Manganese	2,000
Mercury	0.30
Nickel	320
Selenium	110
Silver	110
Zinc	6,600
PCBs	
Total PCBs	1
PFAs	
Perfluorooctanesulfonic acid (PFOS)	0.044
Perfluorooctanoic acid (PFOA)	0.033

RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
All standards are in milligram per kilogram (mg/kg)

Table 4
Soil Samples Analytical Results for VOCs
3083 Webster Avenue, Bronx, NY

Sample ID	TP-1	PE-1	LB-1	PE-2	LB-2	PE-3	LB-3	PE-4	LB-4	PE-5	PE-6	PE-7	Disp-1	Disp-2	B-1	B-2	B-3	B-4	B-5	B-6	UUSCOs	RRSCOs	PGWSCOs
Sampling Depth	18'	5'-6'	11'-12'	7'-8'	11-12'	7'-8'	11-12'	6'-7'	11-12'	3-4'	3-4'	4'-5'	2'-3'	3'-4'	20'	20'	15'	18'	14'	9'			
Sampling Date	9/7/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/26/2021	8/26/2021	8/26/2021	8/26/2021	9/7/2021	9/7/2021	9/7/2021	8/26/2021	8/26/2021	12/23/2021	12/23/2021	12/23/2021	12/23/2021	12/23/2021	12/23/2021			
Client Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Unit	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg			
1,2,4-Trimethylbenzene	**28**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	3.6	52	3.6
1,3,5-Trimethylbenzene	**7.70**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	8.4	52	8.4
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	0.06	4.8	0.06
Ethylbenzene	**0.64**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	1	41	1
Isopropylbenzene	**0.53**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	~	~	~
m&p-Xylene	**3**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	0.26	100	1.6
Methyl t-Butyl Ether (MTBE)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	0.93	100	0.93
Naphthalene	**4**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.005**	**0.005**	**0.005**	**0.005**	**0.006**	**0.005**	~	~	~
n-Butylbenzene	**1.20**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	12	100	12
n-Propylbenzene	**2.90**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	3.9	100	3.9
o-Xylene	**0.17**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	0.26	100	1.6
p-Isopropyltoluene	**0.27**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	~	~	~
sec-Butylbenzene	**0.64**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	11	100	11
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**	5.9	100	5.9
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	0.7	100	0.7
Total Xylenes	**3.17**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	0.26	100	1.6

NOTES:
ND= Not detected
UUSCOS=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCO=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater
indicates concentration exceeds PGWSCO

Table 4 (Cont.)
Soil Samples Analytical Results for VOCs
3083 Webster Avenue, Bronx, NY

Sample ID	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SP-1	SP-1	SP-2	SP-2	SP-3	SP-3	SP-4	SP-4	SP-5	SP-5	SP-6	SP-6	SP-7	SP-7	SP-8	SP-8	UUSCOs	RRSCOs	PWGSCOs
Sampling Depth	10-'13'	15'-17'	25'-27	11-'13'	18'-20'	12'-15'	0-2'	2'-4'	0-2'	10'-12'	0-2'	10'-12'	0-2'	10'-12'	0-2'	10'-12'	0-2'	2'-4'	0-2'	10'-12'	0-2'	16'-18'			
Sampling Date	10/8/2009	10/8/2009	10/8/2009	10/8/2009	10/8/2009	10/8/2009	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024			
Client Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Unit	Result	Result	Result	Result	Result	Result	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg			
Compound	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q			
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.68	100	0.68
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon	NT	NT	NT	NT	NT	NT	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.27	26	0.27
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.33	100	0.33
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,2,3-Trichloropropane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	3.6	52	3.6
1,2-Dibromo-3-chloropropane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,2-Dibromoethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	1.1	100	1.1
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.02	3.1	0.02
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	8.4	52	8.4
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	2.4	49	2.4
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	1.8	13	1.8
1,4-Dioxane	NT	NT	NT	NT	NT	NT	0.027 U	0.0310 U	0.0490 U	0.0250 U	0.0350 U	0.0430 U	0.0370 U	0.0460 U	0.0490 U	0.0300 U	0.0470 U	0.0440 U	0.040 U	0.045 U	0.031 U	0.0500 U	0.1	13	0.1
2-Butanone	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.12	100	0.12
2-Hexanone	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Acetone	ND	ND	ND	ND	ND	ND	0.0027 U	0.0031 U	0.0049 U	0.0025 U	0.0035 U	0.0043 U	0.0037 U	0.0046 U	0.0049 U	0.0030 U	0.0047 U	0.0044 U	0.004 U	0.0045 U	0.0031 U	0.005 U	0.05	100	0.05
Acrolein	NT	NT	NT	NT	NT	NT	0.0027 U	0.0031 U	0.0049 U	0.0025 U	0.0035 U	0.0043 U	0.0037 U	0.0046 U	0.0049 U	0.0030 U	0.0047 U	0.0044 U	0.004 U	0.0045 U	0.0031 U	0.005 U	~	~	~
Acrylonitrile	NT	NT	NT	NT	NT	NT	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Benzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.06	4.8	0.06
Bromochloromethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Bromodichloromethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Bromoform	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Bromomethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Carbon disulfide	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.76	2.4	0.76
Chlorobenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	1.1	100	1.1
Chloroethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Chloroform	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.37	49	0.37
Chloromethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
cis-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.25	100	0.25
cis-1,3-Dichloropropylene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Cyclohexane	NT	NT	NT	NT	NT	NT	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Dibromochloromethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Dibromomethane	NT	NT	NT	NT	NT	NT	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Ethyl Benzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	1	41	1
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Isopropylbenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Methyl acetate	NT	NT	NT	NT	NT	NT	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Methyl tert-butyl ether (MTBE)	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.93	100	0.93
Methylcyclohexane	NT	NT	NT	NT	NT	NT	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Methylene chloride	ND	ND	ND	ND	ND	ND	0.0027 U	0.0031 U	0.0049 U	0.0025 U	0.0035 U	**0.005** JB	0.0037 U	0.0046 U	**0.011** B	0.0030 U	0.0047 U	0.0044 U	0.004 U	**0.005** JB	0.0031 U	0.005 U	0.05	100	0.05
Naphthalene	ND	ND	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT			
n-Butylbenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	12	100	12
n-Propylbenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	3.9	100	3.9
o-Xylene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.26	100	1.6
p- & m- Xylenes	ND	ND	ND	ND	ND	ND	0.0027 U	0.0031 U	0.0049 U	0.0025 U	0.0035 U	0.0043 U	0.0037 U	0.0046 U	0.0049 U	0.0030 U	0.0047 U	0.0044 U	0.004 U	0.0045 U	0.0031 U	0.0050 U	0.26	100	1.6
p-Isopropyltoluene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	11	100	11
Styrene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
tert-Butyl alcohol (TBA)	NT	NT	NT	NT	NT	NT	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	5.9	100	5.9
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	**0.002** J	0.0025 U	0.0025 U	1.3	19	1.3
Toluene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.7	100	0.7
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.19	100	0.19
trans-1,3-Dichloropropylene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
trans-1,4-dichloro-2-butene	NT	NT	NT	NT	NT	NT	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Trichloroethylene	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.47	21	0.47
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	~	~	~
Vinyl Chloride	ND	ND	ND	ND	ND	ND	0.0013 U	0.0016 U	0.0025 U	0.0012 U	0.0018 U	0.0022 U	0.0018 U	0.0023 U	0.0024 U	0.0015 U	0.0023 U	0.0022 U	0.002 U	0.0023 U	0.0015 U	0.0025 U	0.02	0.9	0.02
Xylenes, Total	ND	ND	ND	ND	ND	ND	0.004 U	0.0047 U	0.0074 U	0.0037 U	0.0053 U	0.0065 U	0.0055 U	0.0069 U	0.0073 U	0.0044 U	0.0070 U	0.0067 U	0.0059 U	0.0068 U	0.0046 U	0.0075 U	0.26	100	1.6

NOTES:
Q is the Qualifier Column with definitions as follows:
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated
B=analyte found in the analysis batch blank
ND=this indicates the analyte was not detected
NT=this indicates the analyte was not a target for this sample
~=this indicates that no regulatory limit has been established for this analyte
UUSCOS=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCO=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater

Table 4 (Cont.)
Soil Samples Analytical Results for VOCs
3083 Webster Avenue, Bronx, NY

Sample Identification	SP-9		SP-10		SP-11				SP-12				SP-13		SP-14		SP-15				SP-16				SP-17				UUSCOs	RRSCOs	PWGSCOs
Sample Depth	12-14ft		5-7ft		0-2ft		13-15ft		0-2ft		7-9ft		8-10ft		16-18ft		0-2ft		7-9ft		0-2ft		8-10ft		0-2ft		12-14ft				
Sample Date	7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025				
Sample Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil				
Units	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	mg/kg	mg/kg
1,1,1,2-Tetrachloroethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,1,1-Trichloroethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.68	100	0.68
1,1,2,2-Tetrachloroethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,1,2-Trichloroethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,1-Dichloroethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.27	26	0.27
1,1-Dichloroethylene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.33	100	0.33
1,2,3-Trichlorobenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,2,3-Trichloropropane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,2,4-Trichlorobenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,2,4-Trimethylbenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	3.6	52	3.6
1,2-Dibromo-3-chloropropane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,2-Dibromoethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,2-Dichlorobenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	1.1	100	1.1
1,2-Dichloroethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.02	3.1	0.02
1,2-Dichloropropane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
1,3,5-Trimethylbenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	8.4	52	8.4
1,3-Dichlorobenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	2.4	49	2.4
1,4-Dichlorobenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	1.8	13	1.8
1,4-Dioxane	0.0550	U	0.0470	U	NT		0.051	U	0.0430	U	0.0540	U	0.057	U	0.047	U	0.062	U	0.059	U	0.0660	U	0.0550	U	0.055	U	0.056	U	0.1	13	0.1
2-Butanone	0.00270	U	0.00240	U	**0.004**	**J**	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.12	100	0.12
2-Hexanone	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
4-Methyl-2-pentanone	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Acetone	0.00550	U	0.00470	U	**0.027**		**0.006**	**J**	**0.009**		0.00540	U	**0.008**	**J**	**0.006**	**J**	0.0062	U	0.0059	U	0.00660	U	0.00550	U	**0.009**	**J**	0.0056	U	0.05	100	0.05
Acrolein	0.00550	U	0.00470	U	0.007	U	0.0051	U	0.00430	U	0.00540	U	0.0057	U	0.0047	U	0.0062	U	0.0059	U	0.00660	U	0.00550	U	0.0055	U	0.0056	U	~	~	~
Acrylonitrile	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Benzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.06	4.8	0.06
Bromochloromethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Bromodichloromethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Bromoform	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Bromomethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Carbon disulfide	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Carbon tetrachloride	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.76	2.4	0.76
Chlorobenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	1.1	100	1.1
Chloroethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Chloroform	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.37	49	0.37
Chloromethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
cis-1,2-Dichloroethylene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
cis-1,3-Dichloropropylene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Cyclohexane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Dibromochloromethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Dibromomethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Dichlorodifluoromethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Ethyl Benzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	1	41	1
Hexachlorobutadiene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Isopropylbenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Methyl acetate	0.00270	U	**0.003**	J	0.0035	U	0.0025	U	**0.003**	J	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Methyl tert-butyl ether (MTBE)	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.93	100	0.93
Methylcyclohexane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Methylene chloride	0.00550	U	0.00470	U	0.007	U	0.0051	U	0.00430	U	0.00540	U	0.0057	U	0.0047	U	0.0062	U	0.0059	U	0.00660	U	0.00550	U	0.0055	U	0.0056	U	0.05	100	0.05
n-Butylbenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	12	100	12
n-Propylbenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	3.9	100	3.9
o-Xylene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.26	100	1.6
p- & m- Xylenes	0.00550	U	0.00470	U	0.007	U	0.0051	U	0.00430	U	0.00540	U	0.0057	U	0.0047	U	0.0062	U	0.0059	U	0.00660	U	0.00550	U	0.0055	U	0.0056	U	0.26	100	1.6
p-Isopropyltoluene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
sec-Butylbenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	11	100	11
Styrene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
tert-Butyl alcohol (TBA)	0.0140	U	0.0120	U	0.017	U	0.013	U	0.0110	U	0.0130	U	0.014	U	0.012	U	0.015	U	0.015	U	0.0170	U	0.0140	U	0.014	U	0.014	U	~	~	~
tert-Butylbenzene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	5.9	100	5.9
Tetrachloroethylene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	J	0.0028	U	1.3	19	1.3
Toluene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.7	100	0.7
trans-1,2-Dichloroethylene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
trans-1,3-Dichloropropylene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
trans-1,4-dichloro-2-butene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Trichloroethylene	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.47	21	0.47
Trichlorofluoromethane	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.003	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	~	~	~
Vinyl Chloride	0.00270	U	0.00240	U	0.0035	U	0.0025	U	0.00210	U	0.00270	U	0.0028	U	0.0024	U	0.0031	U	0.0029	U	0.00330	U	0.00280	U	0.0028	U	0.0028	U	0.02	0.9	0.02
Xylenes, Total	0.00820	U	0.00710	U	0.010	U	0.0076	U	0.00640	U	0.00810	U	0.0085	U	0.007	U	0.009	U	0.0088	U	0.00990	U	0.00830	U	0.0083	U	0.008	U	0.26	100	1.6

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
~=No standard available for target analyte
EB=equipment blank
TB=trip blank
UUSCOs=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOs=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCOs=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater
Bolded indicates concentration is greater than MDL

Table 4 (Cont.)
Soil Samples Analytical Results for SVOCs
3083 Webster Avenue, Bronx, NY

Sample ID	TP-1	PE-1	LB-1	PE-2	LB-2	PE-3	LB-3	PE-4	LB-4	PE-5	PE-6	PE-7	Disp-1	Disp-2	B-1	B-2	B-3	B-4	B-5	B-6	UUSCOs	RRSCOs	PGWSCOs
Sampling Depth	18'	5'-6'	11'-12'	7'-8'	11-12'	7'-8'	11-12'	6'-7'	11-12'	3-4'	3-4'	4'-5'	2'-3'	3'-4'	20'	20'	15'	18'	14'	9'			
Sampling Date	9/7/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/26/2021	26/8/2021	8/26/2021	26/8/2021	9/7/2021	9/7/2021	9/7/2021	26/8/2021	26/8/2021	12/23/2021	12/23/2021	12/23/2021	12/23/2021	12/23/2021	12/23/2021			
Client Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Unit	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg			
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	100	98
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	100	107
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	100	1000
Benz(a)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	1	1
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.04**	ND	ND	ND	ND	1	1	22
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	1	1.7
Benzo(ghi)perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	100	1000
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.8	3.9	1.7
Chrysene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	3.9	1
Dibenz(a,h)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.33	0.33	1000
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	100	1000
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30	100	386
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.04**	ND	ND	ND	ND	0.5	0.5	8.2
Naphthalene	**1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12	100	12
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	100	1000
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	100	1000

NOTES:
ND=this indicates the analyte was not detected
UUSCOS=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCO=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater

Table 4 (Cont.)
Soil Samples Analytical Results for SVOCs
3083 Webster Avenue, Bronx, NY

Sample ID	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SP-1	SP-1	SP-2	SP-2	SP-3	SP-3	SP-4	SP-4	SP-5	SP-5	SP-6	SP-6	SP-7	SP-7	SP-8	SP-8	SP-8	UUSCOs	RRSCOs	PWGSCOs
Sampling Depth	10-'13'	15'-17'	25'-27	11-'13'	18'-20'	12'-15'	0-2'	2'-4'	0-2'	10'-12'	0-2'	10'-12'	0-2'	10'-12'	0-2'	10'-12'	0-2'	2'-4'	0-2'	10'-12'	0-2'	10'-12'	16'-18'			
Sampling Date	10/08/09	10/08/09	10/08/09	10/08/09	10/08/09	10/08/09	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024	7/24/2024			
Client Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Unit	Result	Result	Result	Result	Result	Result	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg			
Compound	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q			
1,1-Biphenyl	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	**0.10** JD	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
1,2,4,5-Tetrachlorobenzene	NT	NT	NT	NT	NT	NT	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	1.1	100	1.1
1,2-Diphenylhydrazine	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	2.4	49	2.4
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	1.8	13	1.8
1,4-Dioxane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0198 U	0.0198 U	NT	0.1	13	0.1
2,3,4,6-Tetrachlorophenol	NT	NT	NT	NT	NT	NT	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
2,4,5-Trichlorophenol	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
2,4-Dichlorophenol	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
2-Chloronaphthalene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
2-Chlorophenol	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
2-Methylnaphthalene	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	**0.27** D	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	
2-Methylphenol	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	0.33	100	0.33
2-Nitroaniline	NT	NT	NT	NT	NT	NT	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
2-Nitrophenol	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
3- & 4-Methylphenols	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	0.33	100	0.33
3,3-Dichlorobenzidine	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
3-Nitroaniline	NT	NT	NT	NT	NT	NT	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
4,6-Dinitro-2-methylphenol	ND	ND	ND	ND	ND	ND	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
4-Chloro-3-methylphenol	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
4-Chloroaniline	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
4-Nitroaniline	NT	NT	NT	NT	NT	NT	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
4-Nitrophenol	ND	ND	ND	ND	ND	ND	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
Acenaphthene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	**0.05** JD	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	**1.39** D	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	20	100	98
Acenaphthylene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	**0.07** JD	0.0437 U	**0.13** D	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	100	100	107
Acetophenone	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Aniline	NT	NT	NT	NT	NT	NT	0.193 U	0.187 U	0.188 U	0.176 U	0.193 U	0.176 U	0.204 U	0.176 U	0.186 U	0.175 U	0.202 U	0.176 U	0.187 U	0.181 U	0.194 U	NT	0.171 U	~	~	~
Anthracene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	**0.12** D	0.044 U	**0.06** JD	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	**3.15** D	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	100	100	1000
Atrazine	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Benzaldehyde	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Benzidine	ND	ND	ND	ND	ND	ND	0.193 U	0.187 U	0.188 U	0.176 U	0.193 U	0.176 U	0.204 U	0.176 U	0.186 U	0.175 U	0.202 U	0.176 U	0.19 U	0.181 U	0.194 U	NT	0.171 U	~	~	~
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	**0.06** JD	0.0468 U	**0.24** D	0.044 U	**0.37** D	0.044 U	0.051 U	0.044 U	**0.19** D	0.0437 U	**7.16** D	0.044 U	**0.13** D	0.0453 U	**0.07** JD	NT	0.0427 U	1	1	1
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	**0.07** JD	0.0468 U	**0.20** D	0.044 U	**0.37** D	0.044 U	0.051 U	0.044 U	**0.25** D	0.0437 U	**6.45** D	0.044 U	**0.13** D	0.0453 U	**0.06** JD	NT	0.0427 U	1	1	22
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND	**0.07** JD	0.0468 U	**0.28** D	0.044 U	**0.48** D	0.044 U	0.051 U	0.044 U	**0.23** D	0.0437 U	**5.84** D	0.044 U	**0.17** D	0.0453 U	**0.09** JD	NT	0.0427 U	1	1	1.7
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	**0.06** JD	0.0468 U	**0.14** D	0.044 U	**0.28** D	0.044 U	0.051 U	0.044 U	**0.17** D	0.0437 U	**3.92** D	0.044 U	**0.09** JD	**0.05** JD	0.0485 U	NT	0.0427 U	100	100	1000
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND	**0.07** JD	0.0468 U	**0.10** D	0.044 U	**0.41** D	0.044 U	0.051 U	0.044 U	**0.24** D	0.0437 U	**2.65** D	0.044 U	**0.06** JD	0.0453 U	0.0485 U	NT	0.0427 U	0.8	3.9	1.7
Benzoic acid	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Benzyl alcohol	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Benzyl butyl phthalate	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	**0.388** D	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Bis(2-chloroethyl)ether	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	**0.37** D	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Caprolactam	NT	NT	NT	NT	NT	NT	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
Carbazole	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	**0.06** JD	0.044 U	**0.08** JD	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	**1.6** D	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Chrysene	ND	ND	ND	ND	ND	ND	**0.08** JD	0.0468 U	**0.24** D	0.044 U	**0.45** D	0.044 U	0.051 U	0.044 U	**0.22** D	0.0437 U	**6.83** D	0.044 U	**0.15** D	0.0453 U	**0.07** JD	NT	0.0427 U	1	3.9	1
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	**0.10** D	0.044 U	0.051 U	0.044 U	**0.06** JD	0.0437 U	**0.93** D	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	0.33	0.33	1000
Dibenzofuran	NT	NT	NT	NT	NT	NT	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	**0.98** D	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	7	59	210
Diethyl phthalate	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Dimethyl phthalate	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Diphenylamine	NT	NT	NT	NT	NT	NT	0.0963 U	0.0934 U	0.0938 U	0.0878 U	0.0963 U	0.0878 U	0.102 U	0.0877 U	0.0929 U	0.0873 U	0.101 U	0.0877 U	0.0932 U	0.0904 U	0.0968 U	NT	0.0852 U	~	~	~
Fluoranthene	ND	ND	ND	ND	ND	ND	**0.135** D	0.0468 U	**0.54** D	0.044 U	**0.86** D	0.044 U	0.051 U	0.044 U	**0.32** D	0.0437 U	**15.9** D	0.044 U	**0.27** D	0.0453 U	**0.10** D	NT	0.0427 U	100	100	1000
Fluorene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	**0.05** JD	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	**1.27** D	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	30	100	386
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	0.33	1.2	3.2
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Hexachloroethane	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND	**0.06** JD	0.0468 U	**0.16** D	0.044 U	**0.05** JD	0.044 U	0.051 U	0.044 U	**0.15** D	0.0437 U	**4.13** D	0.044 U	**0.10** D	0.0453 U	**0.06** JD	NT	0.0427 U	0.5	0.5	8.2
Isophorone	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Naphthalene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	**0.47** D	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	12	100	12
Nitrobenzene	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
N-Nitrosodimethylamine	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
N-nitroso-di-n-propylamine	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
N-Nitrosodiphenylamine	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	~	~	~
Pentachlorophenol	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	0.8	6.7	0.8
Phenanthrene	ND	ND	ND	ND	ND	ND	**0.07** JD	0.0468 U	**0.57** D	0.044 U	**0.44** D	0.044 U	0.051 U	0.044 U	**0.13** D	0.0437 U	**15.4** D	0.044 U	**0.129** D	0.0453 U	**0.05** JD	NT	0.0427 U	100	100	1000
Phenol	ND	ND	ND	ND	ND	ND	0.0482 U	0.0468 U	0.047 U	0.044 U	0.0483 U	0.044 U	0.051 U	0.044 U	0.0466 U	0.0437 U	0.0504 U	0.044 U	0.0467 U	0.0453 U	0.0485 U	NT	0.0427 U	0.33	100	0.33
Pyrene	ND	ND	ND	ND	ND	ND	**0.12** D	0.0468 U	**0.47** D	0.044 U	**0.70** D	0.044 U	0.051 U	0.044 U	**0.25** D	0.0437 U	**14.5** D	0.044 U	**0.258** D	**0.05** JD	**0.10** D	NT	0.0427 U	100	100	1000

NOTES:
Q is the Qualifier Column with definitions as follows:
D=result is from an analysis that required a dilution
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated
ND=this indicates the analyte was not detected
NT=this indicates the analyte was not a target for this sample
~=this indicates that no regulatory limit has been established for this analyte
UUSCOS=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCO=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater
indicates concentration exceeds RRSCO
indicates concentration exceeds PGWSCO

Table 4 (Cont.)
Soil Samples Analytical Results for SVOCs
3083 Webster Avenue, Bronx, NY

Sample Identification	SP-9		SP-10		SP-11				SP-12				SP-13		SP-14		SP-15				SP-16				SP-17				UUSCOs	RRSCOs	PWGSCOs
Sample Depth	12-14ft		5-7ft		0-2ft		13-15ft		0-2ft		7-9ft		8-10ft		16-18ft		0-2ft		7-9ft		0-2ft		8-10ft		0-2ft		12-14ft				
Sample Date	7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025				
Sample Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil				
Units	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	mg/kg	mg/kg
1,1-Biphenyl	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
1,2,4,5-Tetrachlorobenzene	0.0864	U	0.0857	U	0.085	U	0.088	U	0.0904	U	0.0884	U	0.085	U	0.091	U	0.098	U	0.087	U	0.0905	U	0.0969	U	0.092	U	0.085	U	~	~	~
1,2,4-Trichlorobenzene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
1,2-Dichlorobenzene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	1.1	100	1.1
1,2-Diphenylhydrazine (as Azobenzene)	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
1,3-Dichlorobenzene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	2.4	49	2.4
1,4-Dichlorobenzene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	1.8	13	1.8
1-Methylnaphthalene	0.0864	U	0.0857	U	0.085	U	0.088	U	0.0904	U	0.0884	U	0.085	U	0.091	U	0.098	U	0.087	U	0.0905	U	0.0969	U	0.092	U	0.085	U	~	~	~
2,3,4,6-Tetrachlorophenol	0.0864	U	0.0857	U	0.085	U	0.088	U	0.0904	U	0.0884	U	0.09	U	0.091	U	0.098	U	0.087	U	0.0905	U	0.0969	U	0.092	U	0.085	U	~	~	~
2,4,5-Trichlorophenol	0.0433	U	0.0430	U	0.043	U	0.04	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
2,4,6-Trichlorophenol	0.0433	U	0.0430	U	0.043	U	0.04	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
2,4-Dichlorophenol	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
2,4-Dimethylphenol	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
2,4-Dinitrophenol	0.0864	U	0.0857	U	0.085	U	0.09	U	0.0904	U	0.0884	U	0.085	U	0.091	U	0.098	U	0.087	U	0.0905	U	0.0969	U	0.092	U	0.085	U	~	~	~
2,4-Dinitrotoluene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
2,6-Dinitrotoluene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
2-Chloronaphthalene	0.0433	U	0.0430	U	0.043	U	0.04	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
2-Chlorophenol	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
2-Methylnaphthalene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
2-Methylphenol	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	0.33	100	0.33
2-Nitroaniline	0.0864	U	0.0857	U	0.085	U	0.088	U	0.0904	U	0.0884	U	0.09	U	0.091	U	0.098	U	0.087	U	0.0905	U	0.0969	U	0.092	U	0.085	U	~	~	~
2-Nitrophenol	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
3- & 4-Methylphenols	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
3,3-Dichlorobenzidine	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
3-Nitroaniline	0.0864	U	0.0857	U	0.085	U	0.088	U	0.0904	U	0.0884	U	0.085	U	0.091	U	0.098	U	0.087	U	0.0905	U	0.0969	U	0.092	U	0.085	U	~	~	~
4,6-Dinitro-2-methylphenol	0.0864	U	0.0857	U	0.085	U	0.088	U	0.0904	U	0.0884	U	0.09	U	0.09	U	0.098	U	0.09	U	0.0905	U	0.0969	U	0.092	U	0.085	U	~	~	~
4-Bromophenyl phenyl ether	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.05	U	0.049	U	0.04	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
4-Chloro-3-methylphenol	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.04	U	~	~	~
4-Chloroaniline	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
4-Chlorophenyl phenyl ether	0.0433	U	0.0430	U	0.04	U	0.0439	U	0.0453	U	0.0443	U	0.04	U	0.05	U	0.0492	U	0.04	U	0.0454	U	0.0486	U	0.046	U	0.04	U	~	~	~
4-Nitroaniline	0.0864	U	0.0857	U	0.085	U	0.088	U	0.0904	U	0.0884	U	0.085	U	0.091	U	0.098	U	0.09	U	0.0905	U	0.0969	U	0.092	U	0.09	U	~	~	~
4-Nitrophenol	0.0864	U	0.0857	U	0.08	U	0.088	U	0.0904	U	0.0884	U	0.09	U	0.09	U	0.098	U	0.09	U	0.0905	U	0.0969	U	0.092	U	0.09	U	~	~	~
Acenaphthene	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.04	U	0.0454	U	0.0486	U	0.046	U	0.04	U	20	100	98
Acenaphthylene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.05	U	0.049	U	0.04	U	0.0454	U	0.0486	U	0.046	U	0.04	U	100	100	107
Acetophenone	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.04	U	0.0454	U	0.0486	U	0.046	U	0.04	U	~	~	~
Aniline	0.173	U	0.172	U	0.17	U	0.175	U	0.181	U	0.177	U	0.17	U	0.181	U	0.197	U	0.17	U	0.181	U	0.194	U	0.18	U	0.17	U	~	~	~
Anthracene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	100	100	1,000
Atrazine	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Benzaldehyde	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Benzidine	0.173	U	0.172	U	0.17	U	0.175	U	0.181	U	0.177	U	0.17	U	0.181	U	0.20	U	0.174	U	0.181	U	0.194	U	0.18	U	0.171	U	~	~	~
Benzo(a)anthracene	0.0433	U	0.0430	U	**0.08**	**JD**	0.044	U	**0.07**	**JD**	0.0443	U	0.04	U	0.045	U	**0.10**	**D**	0.044	U	**0.06**	**JD**	0.0486	U	0.05	U	0.043	U	1	1	1
Benzo(a)pyrene	0.0433	U	0.0430	U	**0.08**	**JD**	0.044	U	**0.100**	**D**	0.0443	U	0.04	U	0.05	U	**0.10**	**D**	0.04	U	**0.06**	**JD**	0.0486	U	0.05	U	0.043	U	1	1	22
Benzo(b)fluoranthene	0.0433	U	0.0430	U	**0.08**	**JD**	0.044	U	**0.108**	**D**	0.0443	U	0.04	U	0.05	U	**0.107**	**D**	0.04	U	**0.07**	**JD**	0.0486	U	0.05	U	0.04	U	1	1	1.7
Benzo(g,h,i)perylene	0.0433	U	0.0430	U	**0.06**	**JD**	0.044	U	**0.09**	**JD**	0.0443	U	0.04	U	0.045	U	**0.07**	**JD**	0.04	U	**0.06**	**JD**	0.0486	U	0.05	U	0.04	U	100	100	1,000
Benzo(k)fluoranthene	0.0433	U	0.0430	U	**0.07**	**JD**	0.044	U	**0.095**	**D**	0.0443	U	0.043	U	0.045	U	**0.11**	**D**	0.044	U	**0.06**	**JD**	0.0486	U	0.046	U	0.043	U	0.8	3.9	1.7
Benzoic acid	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Benzyl alcohol	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Benzyl butyl phthalate	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Bis(2-chloroethoxy)methane	0.0433	U	0.0430	U	0.04	U	0.04	U	0.0453	U	0.0443	U	0.0426	U	0.045	U	0.05	U	0.044	U	0.0454	U	0.0486	U	0.05	U	0.043	U	~	~	~
Bis(2-chloroethyl)ether	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.0454	U	0.049	U	0.04	U	0.0454	U	0.0486	U	0.046	U	0.04	U	~	~	~
Bis(2-chloroisopropyl)ether	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.05	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.05	U	0.04	U	~	~	~
Bis(2-ethylhexyl)phthalate	0.0433	U	0.0430	U	0.043	U	0.044	U	**0.06**	**JD**	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Caprolactam	0.0864	U	0.0857	U	0.08	U	0.088	U	0.0904	U	0.0884	U	0.09	U	0.091	U	0.098	U	0.087	U	0.0905	U	0.0969	U	0.092	U	0.085	U	~	~	~
Carbazole	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.05	U	0.044	U	0.0454	U	0.0486	U	0.05	U	0.043	U	~	~	~
Chrysene	0.0433	U	0.0430	U	**0.09**	**D**	0.04	U	**0.08**	**JD**	0.0443	U	0.043	U	0.045	U	**0.119**	**D**	0.044	U	**0.07**	JD	0.0486	U	0.046	U	0.043	U	1	3.9	1
Cresols, total	0.0864	U	0.0857	U	0.08	U	0.088	U	0.0904	U	0.0884	U	0.09	U	0.091	U	0.098	U	0.09	U	0.0905	U	0.0969	U	0.092	U	0.09	U	~	~	~
Dibenzo(a,h)anthracene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	0.33	0.33	1,000
Dibenzofuran	0.0433	U	0.0430	U	0.043	U	0.04	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	7	59	210
Diethyl phthalate	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Dimethyl phthalate	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Di-n-butyl phthalate	0.0433	U	0.0430	U	0.04	U	0.04	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.05	U	0.044	U	0.0454	U	0.0486	U	0.05	U	0.043	U	~	~	~
Di-n-octyl phthalate	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Diphenylamine	0.0864	U	0.0857	U	0.085	U	0.088	U	0.0904	U	0.0884	U	0.085	U	0.091	U	0.098	U	0.087	U	0.0905	U	0.0969	U	0.092	U	0.085	U	~	~	~
Fluoranthene	0.0433	U	0.0430	U	**0.09**	**D**	0.044	U	0.0716	JD	0.0443	U	0.04	U	0.05	U	**0.16**	**D**	0.04	U	**0.11**	D	0.0486	U	**0.05**	**JD**	0.04	U	100	100	1,000
Fluorene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	30	100	386
Hexachlorobenzene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.05	U	0.049	U	0.04	U	0.0454	U	0.0486	U	0.046	U	0.04	U	0.33	1.2	3.2
Hexachlorobutadiene	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.05	U	0.04	U	0.0454	U	0.0486	U	0.05	U	0.04	U	~	~	~
Hexachlorocyclopentadiene	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Hexachloroethane	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Indeno(1,2,3-cd)pyrene	0.0433	U	0.0430	U	0.043	U	0.044	U	**0.06**	JD	0.0443	U	0.043	U	0.045	U	**0.05**	**JD**	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	0.5	0.5	8.2
Isophorone	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Naphthalene	0.0433	U	0.0430	U	0.04	U	0.04	U	0.0453	U	0.0443	U	0.0426	U	0.045	U	0.05	U	0.044	U	0.0454	U	0.0486	U	0.05	U	0.043	U	12	100	12
Nitrobenzene	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.0454	U	0.049	U	0.04	U	0.0454	U	0.0486	U	0.046	U	0.04	U	~	~	~
N-Nitrosodimethylamine	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.04	U	~	~	~
N-nitroso-di-n-propylamine	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.05	U	0.044	U	0.0454	U	0.0486	U	0.05	U	0.043	U	~	~	~
N-Nitrosodiphenylamine	0.0433	U	0.0430	U	0.043	U	0.044	U	0.0453	U	0.0443	U	0.043	U	0.045	U	0.049	U	0.044	U	0.0454	U	0.0486	U	0.046	U	0.043	U	~	~	~
Parathion	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.05	U	0.044	U	0.0454	U	0.0486	U	0.05	U	0.043	U	~	~	~
Pentachloronitrobenzene	0.0864	U	0.0857	U	0.08	U	0.088	U	0.0904	U	0.0884	U	0.09	U	0.091	U	0.10	U	0.087	U	0.0905	U	0.0969	U	0.09	U	0.085	U	~	~	~
Pentachlorophenol	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.05	U	0.044	U	0.0454	U	0.0486	U	0.05	U	0.043	U	0.8	6.7	0.8
Phenanthrene	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	**0.06**	**JD**	0.044	U	**0.06**	JD	0.0486	U	0.05	U	0.043	U	100	100	1,000
Phenol	0.0433	U	0.0430	U	0.04	U	0.044	U	0.0453	U	0.0443	U	0.04	U	0.045	U	0.05	U	0.044	U	0.0454	U	0.0486	U	0.05	U	0.043	U	0.33	100	0.33
Propargite	0.173	U	0.172	U	0.170	U	0.175	U	0.181	U	0.177	U	0.170	U	0.181	U	0.197	U	0.174	U	0.181	U	0.194	U	0.184	U	0.17	U	~	~	~
Pyrene	0.0433	U	0.0430	U	**0.12**	**D**	0.044	U	**0.07**	**JD**	0.0443	U	0.04	U	0.045	U	**0.16**	**D**	0.044	U	**0.10**	D	0.0486	U	**0.05**	**JD**	0.043	U	100	100	1,000
Pyridine	0.173	U	0.172	U	0.170	U	0.175	U	0.181	U	0.177	U	0.170	U	0.181	U	0.197	U	0.174	U	0.181	U	0.194	U	0.184	U	0.171	U	~	~	~
Resorcinol	0.173	U	0.172	U	0.17	U	0.175	U	0.181	U	0.177	U	0.17	U	0.181	U	0.20	U	0.174	U	0.181	U	0.194	U	0.18	U	0.171	U	~	~	~

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
~=No standard available for target analyte
UUSCOS=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCO=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater
Bolded indicates concentration is greater than MDL

Table 4 (Cont.)
Soil Samples Analytical Results for Pesticides and PCBs
3083 Webster Avenue, Bronx, NY

Sample ID	SP-1		SP-1		SP-2		SP-2		SP-3		SP-3		SP-4		SP-4		SP-5		SP-5		SP-6		SP-6		SP-7		SP-7		SP-8		SP-8		UUSCOs	RRSCOs	PWGSCOs
Sampling Depth	0-2'		2'-4'		0-2'		10'-12'		0-2'		10'-12'		0-2'		10'-12'		0-2'		10'-12'		0-2'		2'-4'		0-2'		10'-12'		0-2'		16'-18'				
Sampling Date	7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024				
Client Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil				
Unit	mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg				
Compound	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q			
Pesticides																																			
4,4'-DDD	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.0033	13	14
4,4'-DDE	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.0033	8.9	17
4,4'-DDT	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.0033	7.9	136
Aldrin	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.005	0.097	0.19
alpha-BHC	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.02	0.48	0.02
alpha-Chlordane	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.094	4.2	2.9
beta-BHC	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.036	0.36	0.09
Chlordane, total	0.0381	U	0.0377	U	0.0371	U	0.0345	U	0.0381	U	0.0348	U	0.040	U	0.0348	U	0.0369	U	0.0342	U	0.0397	U	0.0347	U	0.037	U	0.0359	U	0.0382	U	0.0339	U	~	~	~
delta-BHC	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.04	100	0.25
Dieldrin	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.005	0.2	0.1
Endosulfan I	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	2.4	24	102
Endosulfan II	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	2.4	24	102
Endosulfan sulfate	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	2.4	24	1000
Endrin	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.014	11	0.06
Endrin aldehyde	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	~	~	~
Endrin ketone	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	~	~	~
gamma-BHC (Lindane)	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.1	1.3	0.1
gamma-Chlordane	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	~	~	~
Heptachlor	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	0.042	2.1	0.38
Heptachlor epoxide	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	~	~	~
Methoxychlor	0.0019	U	0.00188	U	0.00186	U	0.00172	U	0.00191	U	0.00174	U	0.002	U	0.00174	U	0.00184	U	0.00171	U	0.00198	U	0.00174	U	0.00185	U	0.00179	U	0.00191	U	0.0017	U	~	~	~
Toxaphene	0.19	U	0.188	U	0.186	U	0.172	U	0.191	U	0.174	U	0.2	U	0.174	U	0.184	U	0.171	U	0.198	U	0.174	U	0.185	U	0.179	U	0.191	U	0.17	U	~	~	~
PCBs																																			
Aroclor 1016	0.0192	U	0.019	U	0.0187	U	0.0174	U	0.0192	U	0.0176	U	0.0202	U	0.0176	U	0.0186	U	0.0173	U	0.02	U	0.0175	U	0.0187	U	0.0181	U	0.0193	U	0.0171	U	~	~	~
Aroclor 1221	0.0192	U	0.019	U	0.0187	U	0.0174	U	0.0192	U	0.0176	U	0.0202	U	0.0176	U	0.0186	U	0.0173	U	0.02	U	0.0175	U	0.0187	U	0.0181	U	0.0193	U	0.0171	U	~	~	~
Aroclor 1232	0.0192	U	0.019	U	0.0187	U	0.0174	U	0.0192	U	0.0176	U	0.0202	U	0.0176	U	0.0186	U	0.0173	U	0.02	U	0.0175	U	0.0187	U	0.0181	U	0.0193	U	0.0171	U	~	~	~
Aroclor 1242	0.0192	U	0.019	U	0.0187	U	0.0174	U	0.0192	U	0.0176	U	0.0202	U	0.0176	U	0.0186	U	0.0173	U	0.02	U	0.0175	U	0.0187	U	0.0181	U	0.0193	U	0.0171	U	~	~	~
Aroclor 1248	0.0192	U	0.019	U	0.0187	U	0.0174	U	0.0192	U	0.0176	U	0.0202	U	0.0176	U	0.0186	U	0.0173	U	0.02	U	0.0175	U	0.0187	U	0.0181	U	0.0193	U	0.0171	U	~	~	~
Aroclor 1254	0.0192	U	0.019	U	0.0187	U	0.0174	U	0.0192	U	0.0176	U	0.0202	U	0.0176	U	0.0186	U	0.0173	U	0.02	U	0.0175	U	0.0187	U	0.0181	U	0.0193	U	0.0171	U	~	~	~
Aroclor 1260	0.0192	U	0.019	U	0.0187	U	0.0174	U	0.0192	U	0.0176	U	0.0202	U	0.0176	U	0.0186	U	0.0173	U	0.02	U	0.0175	U	0.0187	U	0.0181	U	0.0193	U	0.0171	U	~	~	~
Total PCBs	0.0192	U	0.019	U	0.0187	U	0.0174	U	0.0192	U	0.0176	U	0.0202	U	0.0176	U	0.0186	U	0.0173	U	0.02	U	0.0175	U	0.0187	U	0.0181	U	0.0193	U	0.0171	U	0.1	1	1

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
~=this indicates that no regulatory limit has been established for this analyte
UUSCOS=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCO=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater

Table 4 (Cont.)
Soil Samples Analytical Results for Pesticides. Herbicides and PCBs
3083 Webster Avenue, Bronx, NY

Sample Identification	SP-9		SP-10		SP-11		SP-11		SP-12		SP-12		SP-13		SP-14		SP-15		SP-15		SP-16		SP-16		SP-17		SP-17		UUSCOs	RRSCOs	PWGSCOs
Sample Depth	12-14ft		5-7ft		0-2ft		13-15ft		0-2ft		7-9ft		8-10ft		16-18ft		0-2ft		7-9ft		0-2ft		8-10ft		0-2ft		12-14ft				
Sample Date	7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025				
Sample Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil				
Units	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	mg/kg	mg/kg
Pesticides																															
4,4'-DDD	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.0033	13	14
4,4'-DDE	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.0033	8.9	17
4,4'-DDT	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.0033	7.9	136
Aldrin	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.005	0.097	0.19
alpha-BHC	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.02	0.48	0.02
alpha-Chlordane	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.094	4.2	2.9
beta-BHC	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.036	0.36	0.09
delta-BHC	0.00172	U	0.00172	U	0.002	U	0.002	U	0.00182	U	0.00177	U	0.002	U	0.002	U	0.002	U	0.002	U	0.00182	U	0.00194	U	0.002	U	0.002	U	0.04	100	0.25
Dieldrin	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.005	0.2	0.1
Endosulfan I	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	2.4	24	102
Endosulfan II	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	2.4	24	102
Endosulfan sulfate	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	2.4	24	1,000
Endrin	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.014	11	0.06
Endrin aldehyde	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	~	~	~
Endrin ketone	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	~	~	~
gamma-BHC (Lindane)	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.1	1.3	0.1
gamma-Chlordane	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	~	~	~
Heptachlor	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	0.042	2.1	0.38
Heptachlor epoxide	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	~	~	~
Methoxychlor	0.00172	U	0.00172	U	0.0017	U	0.0017	U	0.00182	U	0.00177	U	0.0017	U	0.0018	U	0.0019	U	0.0017	U	0.00182	U	0.00194	U	0.0018	U	0.0017	U	~	~	~
Toxaphene	0.172	U	0.172	U	0.1680	U	0.1730	U	0.182	U	0.177	U	0.1680	U	0.1790	U	0.1940	U	0.172	U	0.182	U	0.194	U	0.1810	U	0.168	U	~	~	~
Herbicides																															
2,4,5-T	0.0208	U	0.0208	U	0.0203	U	0.0210	U	0.0220	U	0.0215	U	0.0201	U	0.0217	U	0.0234	U	0.0207	U	0.0220	U	0.0236	U	0.0219	U	0.0205	U	~	~	~
2,4,5-TP (Silvex)	0.0208	U	0.0208	U	0.0203	U	0.0210	U	0.0220	U	0.0215	U	0.0201	U	0.0217	U	0.0234	U	0.0207	U	0.0220	U	0.0236	U	0.0219	U	0.0205	U	3.8	100	3.8
2,4-D	0.0208	U	0.0208	U	0.0203	U	0.0210	U	0.0220	U	0.0215	U	0.0201	U	0.0217	U	0.0234	U	0.0207	U	0.0220	U	0.0236	U	0.0219	U	0.0205	U	~	~	~
PCBs																															
Aroclor 1016	0.0174	U	0.0174	U	0.017	U	0.017	U	0.0184	U	0.0179	U	0.017	U	0.018	U	0.020	U	0.017	U	0.0184	U	0.0196	U	0.018	U	0.017	U	~	~	~
Aroclor 1221	0.0174	U	0.0174	U	0.017	U	0.017	U	0.0184	U	0.0179	U	0.017	U	0.018	U	0.020	U	0.017	U	0.0184	U	0.0196	U	0.018	U	0.017	U	~	~	~
Aroclor 1232	0.0174	U	0.0174	U	0.017	U	0.017	U	0.0184	U	0.0179	U	0.017	U	0.018	U	0.020	U	0.017	U	0.0184	U	0.0196	U	0.018	U	0.017	U	~	~	~
Aroclor 1242	0.0174	U	0.0174	U	0.017	U	0.017	U	0.0184	U	0.0179	U	0.017	U	0.018	U	0.020	U	0.017	U	0.0184	U	0.0196	U	0.018	U	0.017	U	~	~	~
Aroclor 1248	0.0174	U	0.0174	U	0.017	U	0.017	U	0.0184	U	0.0179	U	0.017	U	0.018	U	0.020	U	0.017	U	0.0184	U	0.0196	U	0.018	U	0.017	U	~	~	~
Aroclor 1254	0.0174	U	0.0174	U	0.017	U	0.017	U	0.0184	U	0.0179	U	0.017	U	0.018	U	0.020	U	0.017	U	0.0184	U	0.0196	U	0.018	U	0.017	U	~	~	~
Aroclor 1260	0.0174	U	0.0174	U	0.017	U	0.017	U	0.0184	U	0.0179	U	0.017	U	0.018	U	0.020	U	0.017	U	0.0184	U	0.0196	U	0.018	U	0.017	U	~	~	~
Total PCBs	0.0174	U	0.0174	U	0.017	U	0.017	U	0.0184	U	0.0179	U	0.017	U	0.018	U	0.020	U	0.017	U	0.0184	U	0.0196	U	0.018	U	0.017	U	0.1	1	3.2

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
~=No standard available for target analyte
EB=equipment blank
NT=this indicates the analyte was not a target for this sample
UUSCOs=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOs=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCOs=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater
Bolded indicates concentration is greater than MDL

Table 4 (Cont.)
Soil Samples Analytical Results for Metals
3083 Webster Avenue, Bronx, NY

Sample ID	SP-1		SP-1		SP-2		SP-2		SP-3		SP-3		SP-4		SP-4		SP-5		SP-5		SP-6		SP-6		SP-7		SP-7		SP-8		SP-8		UUSCOs	RRSCOs	PWGSCOs
Sampling Depth	0-2'		2'-4'		0-2'		10'-12'		0-2'		10'-12'		0-2'		10'-12'		0-2'		10'-12'		0-2'		2'-4'		0-2'		10'-12'		0-2'		16'-18'				
Sampling Date	7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024		7/24/2024				
Client Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil				
Unit	mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg				
Compound	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q			
Aluminum	**16,700**		**18,000**		**11,700**		**12,400**		**20,400**		**9,790**		**23,100**		**12,300**		**12,100**		**18,800**		**13,900**		**29,700**		**11,000**		**7,890**		**13,500**		**11,500**		~	~	~
Antimony	2.41	U	2.39	U	2.35	U	2.2	U	2.43	U	2.22	U	2.55	U	2.21	U	2.34	U	2.19	U	2.52	U	2.21	U	2.35	U	2.27	U	2.45	U	2.17	U	~	~	~
Arsenic	**5.1**		**3.31**		**8.93**		**1.6**		**4.88**		1.33	U	**4.1**		**3.07**		**5.48**		**1.78**		**8.52**		**1.78**		**4.02**		**2.3**		**4.11**		**1.75**		13	16	16
Barium	**129**		**59.4**		**95.6**		**80.2**		**129**		**70.6**		**190**		**47**		**120**		**109**		**228**		**392**		**89.3**		**49.2**		**138**		**111**		350	400	820
Beryllium	**0.36**		**0.33**		**0.30**		0.044	U	**0.50**		**0.11**		**0.36**		**0.20**		**0.17**		**0.27**		**0.55**		0.045	U	**0.09**		**0.08**		**0.26**		0.044	U	7.2	72	47
Cadmium	0.29	U	0.286	U	**0.988**		0.264	U	0.292	U	0.267	U	0.306	U	0.266	U	0.281	U	0.263	U	**1.64**		0.266	U	0.282	U	0.273	U	**0.53**		0.26	U	2.5	4.3	7.5
Calcium	**11,500**		**1,580**		**13,400**		**3,770**		**3,210**		**1,270**		**2,750**		**1,960**		**3,780**		**3,160**		**15,100**		**3,380**		**42,700**		**45,900**		**12,200**		**3,080**		~	~	~
Chromium, Hexavalent	0.579	U	0.573	U	0.564	U	0.528	U	0.583	U	0.533	U	0.612	U	0.531	U	0.562	U	0.527	U	0.605	U	0.531	U	0.564	U	**0.611**		0.588	U	0.521	U	1	110	19
Chromium, Trivalent	**21.90**		**31.6**		**17.5**		**29.5**		**29**		**27.9**		**55.4**		**29.7**		**27.8**		**96.7**		**26.6**		**214**		**25.50**		**16.5**		**33.5**		**32.2**		30	180	~
Cobalt	**8.6**		**10.8**		**7.39**		**12.8**		**9.57**		**11.8**		**13**		**11.2**		**11.4**		**13.3**		**8.14**		**26.9**		**7.42**		**5.72**		**9.2**		**11.3**		~	~	~
Copper	**19.2**		**28**		**50.4**		**71.8**		**17.4**		**30.2**		**31**		**23.4**		**42.5**		**28.6**		**70.90**		**29.1**		**25.8**		**18.4**		**43**		**44.1**		50	270	1720
Iron	**19,700**		**22,200**		**15,300**		**20,100**		**20,800**		**14,400**		**31,600**		**19,100**		**23,600**		**23,700**		**17,400**		**39,800**		**16,900**		**16,800**		**19,000**		**17,500**		~	~	~
Lead	**42.1**		**7.25**		**104**		**2.93**		**21.8**		**2.93**		**10.3**		**18.2**		**102**		**5.62**		**279**		**3.12**		**39.2**		**100**		**177**		**3.31**		63	400	450
Magnesium	**4,350**		**5,970**		**3,930**		**6,410**		**4,490**		**3,880**		**7,110**		**6,430**		**4,530**		**12,000**		**6,710**		**21,400**		**12,200**		**13,600**		**5,080**		**5,840**		~	~	~
Manganese	**282**		**318**		**210**		**345**		**619**		**338**		**164**		**471**		**303**		**362**		**342**		**198**		**283**		**1,010**		**390**		**266**		1600	2000	2000
Mercury	**0.11**		**0.06**		**0.16**		0.0317	U	**0.09**		0.032	U	**0.04**		0.0319	U	**0.11**		0.0316	U	**0.221**		0.0319	U	**0.14**		0.0327	U	**0.06**		0.0313	U	0.18	0.81	0.73
Nickel	**16.4**		**23.5**		**18.9**		**25.40**		**20.5**		**39.6**		**31.5**		**23**		**38.4**		**50.6**		**28.1**		**100**		**16.6**		**11.90**		**23.8**		**27.7**		30	310	130
Potassium	**1,730**		**1,300**		**2,040**		**3,250**		**1,260**		**2,760**		**2,070**		**1,760**		**2,080**		**2,120**		**1,660**		**9,110**		**2,930**		**2,390**		**2,390**		**2,930**		~	~	~
Selenium	2.41	U	2.39	U	2.35	U	2.2	U	2.43	U	**2.22**	U	2.55	U	2.21	U	2.34	U	**2.19**	U	2.52	U	2.21	U	2.35	U	2.27	U	2.45	U	2.17	U	3.9	180	4
Silver	0.486	U	0.481	U	0.474	U	0.443	U	0.49	U	0.448	U	0.514	U	0.446	U	0.472	U	0.442	U	0.508	U	0.446	U	0.474	U	0.458	U	0.494	U	0.438	U	2	180	8.3
Sodium	**327**		**232**		**294**		**279**		**237**		**150**		**362**		**173**		**245**		**233**		**463**		**730**		**258**		**141**		**333**		**373**		~	~	~
Thallium	2.41	U	2.39	U	2.35	U	2.2	U	2.43	U	2.22	U	2.55	U	2.21	U	2.34	U	2.19	U	2.52	U	2.21	U	2.35	U	2.27	U	2.45	U	2.17	U	~	~	~
Vanadium	**32.1**		**39.9**		**25.8**		**42.2**		**38.5**		**34.3**		**75.6**		**33.9**		**34**		**39.6**		**34.7**		**143**		**32.2**		**21.8**		**39**		**36.5**		~	~	~
Zinc	**83.6**		**73.8**		**346**		**47.9**		**57.1**		**44.5**		**63.7**		**43**		**112**		**62.1**		**190**		**116**		**73.9**		**44.2**		**115**		**39.1**		109	10000	2480

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
NT=this indicates the analyte was not a target for this sample
~=this indicates that no regulatory limit has been established for this analyte
UUSCOS=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCO=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater
indicates concentration exceeds UUSCO
indicates concentration exceeds RRSCO

Table 4 (Cont.)
Soil Samples Analytical Results for Metals
3083 Webster Avenue, Bronx, NY

Sample Identification	SP-9		SP-10		SP-11				SP-12				SP-13		SP-14		SP-15				SP-16				SP-17				UUSCOs	RRSCOs	PWGSCOs
Sample Depth	12-14ft		5-7ft		0-2ft		13-15ft		0-2ft		7-9ft		8-10ft		16-18ft		0-2ft		7-9ft		0-2ft		8-10ft		0-2ft		12-14ft				
Sample Date	7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025				
Sample Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil				
Units	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	mg/kg	mg/kg
Aluminum	**19,000**		**26,000**		**11,400**		**11,000**		**9,860**		**14,300**		**10,300**		**8,160**		**8,990**		**10,600**		**11,400**		**20,400**		**19,800**		**10,300**		~	~	~
Antimony	2.180	U	2.180	U	2.13	U	2.20	U	2.300	U	2.250	U	2.14	U	2.28	U	2.47	U	2.20	U	2.310	U	2.470	U	2.32	U	2.16	U	~	~	~
Arsenic	**2.02**		1.310	U	**3**		**1.96**		**7.67**		1.350	U	**1.57**		1.37	U	**6.40**		**1.32**		**3.67**		**4.82**		**4.12**		**7.50**		13	16	16
Barium	**222**		**542**		**106**		**141**		**87.70**		**82.10**		**53.5**		**83.1**		**142**		**55.4**		**96.30**		**111**		**115**		**88.4**		350	400	820
Beryllium	0.0440	U	0.0440	U	0.043	U	0.044	U	0.0460	U	0.0450	U	0.043	U	0.046	U	**0.168**		0.044	U	0.0460	U	**0.05**	U	0.047	U	0.043	U	7.2	72	47
Cadmium	**0.27**		**0.31**		0.26	U	0.26	U	**0.33**		0.270	U	0.26	U	0.27	U	**1.27**		0.26	U	**0.34**		0.296	U	**0.35**		0.26	U	2.5	4.3	7.5
Calcium	**3,840**		**5,440**		**26,700**		**2,790**		**9,790**		**3,190**		**1,830**		**2,170**		**35,200**		**2,800**		**19,800**		**7,340**		**11,800**		**1,580**		~	~	~
Chromium, Hexavalent	0.523	U	0.524	U	0.51	U	0.53	U	0.55	U	0.541	U	0.51	U	**0.72**		0.59	U	0.53	U	0.554	U	0.593	U	0.56	U	**0.63**		1	110	19
Chromium, Trivalent	**28.40**		**178**		**44.3**		**35.3**		**23.70**		**140**		**32.1**		**24.5**		**19.7**		**21.9**		**23.20**		**26.10**		**41.0**		**24.8**		30	180	~
Cobalt	**17.60**		**24.20**		**9.1**		**10.80**		**8.34**		**13.90**		**8.84**		**8.56**		**7.09**		**10.60**		**8.79**		**12.80**		**10.3**		**7.79**		~	~	~
Copper	**27**		**51.80**		**40**		**28.3**		**58.30**		**41.80**		**23.0**		**26.7**		**92.3**		**35.5**		**31.80**		**48.20**		**32.0**		**30.3**		50	270	1,720
Iron	**37,200**		**39,300**		**18,200**		**17,400**		14,200		**20,000**		**15,300**		**13,800**		**18,800**		**17,300**		**15,600**		**27,300**		**22,500**		**15,600**		~	~	~
Lead	**1.81**		**7.30**		**42**		**3.85**		**96**		**3.84**		**8.56**		**6.45**		**268**		**3.29**		**66.30**		**15.80**		**29.3**		**3.01**		63	400	450
Magnesium	**10,600**		**19,200**		**10,700**		**5,750**		**6,640**		**9,450**		**5,910**		**4,690**		**13,300**		**6,170**		**7,450**		**6,040**		**5,260**		**5,690**		~	~	~
Manganese	**446**		**187**		**265**		**391**		**146**		**234**		**258**		**254**		**224**		**248**		**250**		**354**		**338**		**265**		1,600	2,000	2,000
Mercury	0.0314	U	**0.09**		**0.04**		0.032	U	**0.06**		0.0324	U	0.031	U	0.033	U	**0.11**		0.032	U	**0.10**		**0.07**		**0.07**		0.031	U	0.18	0.81	0.73
Nickel	**26.60**		**98.90**		**25.4**		**47.4**		**24.20**		**44.50**		**22.0**		**25.8**		**22.1**		**28.0**		**19.80**		**21.50**		**23.9**		**17.0**		30	310	130
Potassium	**7,330**		**11,600**		**4,790**		**2,970**		**2,010**		**2,610**		**1,720**		**1,850**		**1,200**		**2,250**		**1,670**		**1,580**		**2,010**		**2,410**		~	~	~
Selenium	2.180	U	2.180	U	2.13	U	2.2	U	2.300	U	2.250	U	2.14	U	2	U	2.47	U	2.2	U	2.310	U	2.470	U	2.32	U	2.16	U	3.9	180	4
Silver	0.440	U	0.440	U	0.43	U	0.44	U	0.465	U	0.454	U	0.43	U	0.459	U	0.50	U	0.4	U	0.465	U	0.498	U	0.47	U	0.44	U	2	180	8.3
Sodium	**349**		**497**		**345**		**287**		**334**		**460**		**306**		**205**		**243**		**229**		**171**		**215**		**204**		**134**		~	~	~
Thallium	1.750	U	1.750	U	2	U	2	U	1.850	U	1.810	U	1.7	U	1.8	U	2	U	2	U	1.850	U	1.980	U	1.9	U	1.7	U	~	~	~
Vanadium	**65.30**		**134**		**43.20**		**35.90**		**34.60**		52.400		**32.70**		**30.6**		**30.20**		**35.60**		**29.60**		**53.80**		**47.70**		**32.60**		~	~	~
Zinc	**72.30**		**148**		**78.0**		**46.0**		**93.90**		**57**		**58.8**		**39**		**263**		**38.6**		**71.40**		**69.50**		**116**		**41.0**		109	10,000	2,480

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
~=No standard available for target analyte
EB=equipment blank
UUSCOs=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOs=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
PGWSCOs=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Protection of Groundwater
Bolded indicates concentration is greater than MDL
indicates concentration exceeds UUSCO
indicates concentration exceeds RRSCO

Table 4 (Cont.)
Soil Samples Analytical Results for PFAS
3083 Webster Avenue, Bronx, NY

Sample ID	SP-4		SP-4		SP-8		SP-8		Soil Guidance Values [1]		
Sampling Depth	0-2'		10'-12'		0-2'		10'-12'				
Sampling Date	7/24/2024		7/24/2024		7/24/2024		7/24/2024				
Client Matrix	Soil		Soil		Soil		Soil				
Unit	mg/Kg		mg/Kg		mg/Kg		mg/Kg		Unrestricted	Restricted	Protection of
Compound	Result	Q	Result	Q	Result	Q	Result	Q	Site Use	Site Use	Groundwater
11CL-PF3OUdS	0.00035	U	0.00033	U	0.00037	U	0.00032	U	~	~	~
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	0.00084	U	0.00079	U	0.00089	U	0.00078	U	~	~	~
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	0.00066	U	0.00063	U	0.0007	U	0.00062	U	~	~	~
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.00066	U	0.00063	U	0.0007	U	0.00062	U	~	~	~
3-Perfluoroheptyl propanoic acid (FHpPA)	0.00167	U	0.00158	U	0.00176	U	0.00155	U	~	~	~
3-Perfluoropentyl propanoic acid (FPePA)	0.00234	U	0.00221	U	0.00247	U	0.00217	U	~	~	~
3-Perfluoropropyl propanoic acid (FPrPA)	0.00071	U	0.00067	U	0.00075	U	0.00066	U	~	~	~
9CL-PF3ONS	0.00027	U	0.00026	U	0.00029	U	0.00025	U	~	~	~
ADONA	0.00019	U	0.00018	U	0.0002	U	0.00018	U	~	~	~
HFPO-DA (Gen-X)	0.00068	U	0.00064	U	0.00071	U	0.00063	U	~	~	~
N-EtFOSA	0.00022	U	0.00021	U	0.00023	U	0.00021	U	~	~	~
N-EtFOSAA	0.00022	U	0.0002	U	0.00023	U	0.00020	U	~	~	~
N-EtFOSE	0.00078	U	0.00073	U	0.00082	U	0.00072	U	~	~	~
N-MeFOSA	0.0002	U	0.00019	U	0.00021	U	0.00019	U	~	~	~
N-MeFOSAA	0.00017	U	0.00016	U	0.00017	U	0.00015	U	~	~	~
N-MeFOSE	0.00068	U	0.00064	U	0.00072	U	0.00063	U	~	~	~
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	0.00016	U	0.00015	U	0.00016	U	0.00014	U	~	~	~
Perfluoro-1-decanesulfonic acid (PFDS)	0.00021	U	0.0002	U	0.00022	U	0.00020	U	~	~	~
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.00017	U	0.00016	U	0.00018	U	0.00016	U	~	~	~
Perfluoro-1-nonanesulfonic acid (PFNS)	0.00014	U	0.00013	U	0.00015	U	0.00013	U	~	~	~
Perfluoro-1-octanesulfonamide (FOSA)	0.00016	U	0.00015	U	0.00017	U	0.00015	U	~	~	~
Perfluoro-1-pentanesulfonate (PFPeS)	0.00018	U	0.00017	U	0.00018	U	0.00016	U	~	~	~
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	0.00022	U	0.0002	U	0.00023	U	0.0002	U	~	~	~
Perfluoro-4-oxapentanoic acid (PFMPA)	0.00007	U	0.00007	U	0.00007	U	0.00006	U	~	~	~
Perfluoro-5-oxahexanoic acid (PFMBA)	0.00011	U	0.0001	U	0.00011	U	0.00010	U	~	~	~
Perfluorobutanesulfonic acid (PFBS)	0.00012	U	0.00012	U	0.00013	U	0.00012	U	~	~	~
Perfluorodecanoic acid (PFDA)	0.00021	U	0.0002	U	0.00022	U	0.00020	U	~	~	~
Perfluorododecanesulfonic acid (PFDoS)	0.00019	U	0.00018	U	0.0002	U	0.00018	U	~	~	~
Perfluorododecanoic acid (PFDoA)	0.00018	U	0.00017	U	0.00019	U	0.00017	U	~	~	~
Perfluoroheptanoic acid (PFHpA)	0.00012	U	0.00011	U	0.00012	U	0.00011	U	~	~	~
Perfluorohexanesulfonic acid (PFHxS)	0.0002	U	0.00019	U	0.00021	U	0.00019	U	~	~	~
Perfluorohexanoic acid (PFHxA)	0.00006	U	0.00006	U	0.00006	U	0.00005	U	~	~	~
Perfluoro-n-butanoic acid (PFBA)	0.00012	U	0.00012	U	0.00013	U	0.00011	U	~	~	~
Perfluorononanoic acid (PFNA)	0.00021	U	0.0002	U	0.00022	U	0.0002	U	~	~	~
Perfluorooctanesulfonic acid (PFOS)	0.00019	U	0.00018	U	**0.00039**		0.00017	U	0.00088	0.044	0.001
Perfluorooctanoic acid (PFOA)	0.00019	U	0.00018	U	0.0002	U	0.00018	U	0.00066	0.033	0.0008
Perfluoropentanoic acid (PFPeA)	0.00012	U	0.00012	U	0.00013	U	0.00011	U	~	~	~
Perfluorotetradecanoic acid (PFTA)	0.00012	U	0.00011	U	0.00012	U	0.00011	U	~	~	~
Perfluorotridecanoic acid (PFTrDA)	0.00014	U	0.00013	U	0.00015	U	0.00013	U	~	~	~
Perfluoroundecanoic acid (PFUnA)	0.00022	U	0.00021	U	0.00023	U	0.00021	U	~	~	~

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
~=this indicates that no regulatory limit has been established for this analyte
(1)= NYSDEC Guidance Values for Anticipated Site Use in accordance with Sampling, Analysis, And Assessment Of Per-And Polyfluoroalkyl -Substances (PFAS) - April 2023
Bolded indicates concentration is greater than MDL

Table 4 (Cont.)
Soil Samples Analytical Results for PFAs & 1,4-Dioxane
3083 Webster Avenue, Bronx, NY

Sample Identification	SP-9		SP-10		SP-11				SP-12				SP-13		SP-14		SP-15				SP-16				SP-17				UUSCOs	RRSCOs	PWGSCOs
Sample Depth	12-14ft		5-7ft		0-2ft		13-15ft		0-2ft		7-9ft		8-10ft		16-18ft		0-2ft		7-9ft		0-2ft		8-10ft		0-2ft		12-14ft				
Sample Date	7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025		7/16/2025		7/16/2025		7/15/2025		7/15/2025		7/16/2025		7/16/2025				
Sample Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil				
Units	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q	mg/kg	Q			
1,4-Dioxane																															
1,4-Dioxane	0.0190	U	0.0196	U	0.0192	U	0.0190	U	0.0189	U	0.0185	U	0.0196	U	0.0196	U	0.0198	U	0.0189	U	0.0198	U	0.0198	U	0.0192	U	0.0198	U	0.1	13	0.1
PFAS																													Soil Guidance Value [1]		
																													Unrestricted Site Use	Restricted Site Use	Protection of Groundwater
11CL-PF3OUdS	0.00023	U	0.00023	U	0.0002	U	0.0002	U	0.00024	U	0.00024	U	0.0002	U	0.0002	U	0.0003	U	0.0002	U	0.00024	U	0.00026	U	0.0002	U	0.0002	U	~	~	~
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	0.00017	U	0.00017	U	0.0002	U	0.0002	U	0.00018	U	0.00017	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.00018	U	0.00019	U	0.0002	U	0.0002	U	~	~	~
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	0.00023	U	0.00023	U	0.0002	U	0.0002	U	0.00024	U	0.00024	U	0.0002	U	0.0002	U	0.0003	U	0.0002	U	0.00024	U	0.00026	U	0.0002	U	0.0002	U	~	~	~
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.00019	U	0.00019	U	0.0002	U	0.0002	U	0.00020	U	0.00020	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.00020	U	0.00021	U	0.0002	U	0.0002	U	~	~	~
2H,2H,3H,3H-Perfluorodecanoic acid (7:3FTCA)	0.00098	U	0.00098	U	0.0010	U	0.0010	U	0.00104	U	0.00102	U	0.0010	U	0.0010	U	0.0011	U	0.0010	U	0.00103	U	0.00112	U	0.0010	U	0.0010	U	~	~	~
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	0.00076	U	0.00076	U	0.0007	U	0.0008	U	0.00081	U	0.00079	U	0.0007	U	0.0008	U	0.0009	U	0.0008	U	0.00080	U	0.00087	U	0.0008	U	0.0008	U	~	~	~
4,4,5,5,6,6,6-Heptafluorohexanoic acid (3:3FTCA)	0.00033	U	0.00034	U	0.0003	U	0.0003	U	0.00035	U	0.00035	U	0.0003	U	0.0003	U	0.0004	U	0.0003	U	0.00035	U	0.00038	U	0.0004	U	0.0003	U	~	~	~
9CL-PF3ONS	0.00028	U	0.00028	U	0.0003	U	0.0003	U	0.00030	U	0.00029	U	0.0003	U	0.0003	U	0.0003	U	0.0003	U	0.00030	U	0.00032	U	0.0003	U	0.0003	U	~	~	~
ADONA	0.00027	U	0.00027	U	0.0003	U	0.0003	U	0.00029	U	0.00028	U	0.0003	U	0.0003	U	0.0003	U	0.0003	U	0.00029	U	0.00031	U	0.0003	U	0.0003	U	~	~	~
HFPO-DA (Gen-X)	0.00024	U	0.00024	U	0.0002	U	0.0002	U	0.00025	U	0.00025	U	0.0002	U	0.0002	U	0.0003	U	0.0002	U	0.00025	U	0.00027	U	0.0003	U	0.0002	U	~	~	~
N-EtFOSA	0.00009	U	0.00009	U	0.0001	U	0.0001	U	0.00010	U	0.00010	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00010	U	0.00011	U	0.0001	U	0.0001	U	~	~	~
N-EtFOSAA	0.00009	U	0.00009	U	0.0001	U	0.0001	U	0.00010	U	0.00010	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00010	U	0.00011	U	0.0001	U	0.0001	U	~	~	~
N-EtFOSE	0.00048	U	0.00048	U	0.0005	U	0.0005	U	0.00051	U	0.00050	U	0.0005	U	0.0005	U	0.0005	U	0.0005	U	0.00051	U	0.00055	U	0.0005	U	0.0005	U	~	~	~
N-MeFOSA	0.00014	U	0.00014	U	0.0001	U	0.0001	U	0.00014	U	0.00014	U	0.0001	U	0.0001	U	0.0002	U	0.0001	U	0.00014	U	0.00016	U	0.0001	U	0.0001	U	~	~	~
N-MeFOSAA	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.00009	U	0.00009	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00009	U	0.00010	U	0.0001	U	0.0001	U	~	~	~
N-MeFOSE	0.00076	U	0.00076	U	0.0007	U	0.0008	U	0.00081	U	0.00079	U	0.0007	U	0.0008	U	0.0009	U	0.0008	U	0.00080	U	0.00087	U	0.0008	U	0.0008	U	~	~	~
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	0.00006	U	0.00006	U	0.0001	U	0.0001	U	0.00007	U	0.00007	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00007	U	0.00007	U	0.0001	U	0.0001	U	~	~	~
Perfluoro-1-decanesulfonic acid (PFDS)	0.00006	U	0.00006	U	0.0001	U	0.0001	U	0.00007	U	0.00007	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00007	U	0.00007	U	0.0001	U	0.0001	U	~	~	~
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.00007	U	0.00007	U	0.0001	U	0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	~	~	~
Perfluoro-1-nonanesulfonic acid (PFNS)	0.00015	U	0.00015	U	0.0001	U	0.0001	U	0.00016	U	0.00015	U	0.0001	U	0.0002	U	0.0002	U	0.0001	U	0.00015	U	0.00017	U	0.0002	U	0.0001	U	~	~	~
Perfluoro-1-octanesulfonamide (FOSA)	0.00003	U	0.00003	U	0.0000	U	0.0000	U	0.00003	U	0.00003	U	0.0000	U	0.0000	U	0.0000	U	0.0000	U	0.00003	U	0.00004	U	0.0000	U	0.0000	U	~	~	~
Perfluoro-1-pentanesulfonate (PFPeS)	0.00007	U	0.00007	U	0.0001	U	0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	~	~	~
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	0.00041	U	0.00041	U	0.0004	U	0.0004	U	0.00043	U	0.00042	U	0.0004	U	0.0004	U	0.0005	U	0.0004	U	0.00043	U	0.00046	U	0.0004	U	0.0004	U	~	~	~
Perfluoro-4-oxapentanoic acid (PFMPA)	0.00004	U	0.00004	U	0.0000	U	0.0000	U	0.00004	U	0.00004	U	0.0000	U	0.0000	U	0.0000	U	0.0000	U	0.00004	U	0.00005	U	0.0000	U	0.0000	U	~	~	~
Perfluoro-5-oxahexanoic acid (PFMBA)	0.00013	U	0.00013	U	0.0001	U	0.0001	U	0.00013	U	0.00013	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00013	U	0.00014	U	0.0001	U	0.0001	U	~	~	~
Perfluorobutanesulfonic acid (PFBS)	0.00007	U	0.00007	U	0.0001	U	0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	~	~	~
Perfluorodecanoic acid (PFDA)	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.00009	U	0.00009	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00009	U	0.00010	U	0.0001	U	0.0001	U	~	~	~
Perfluorododecanesulfonic acid (PFDoS)	0.00016	U	0.00016	U	0.0002	U	0.0002	U	0.00017	U	0.00016	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.00017	U	0.00018	U	0.0002	U	0.0002	U	~	~	~
Perfluorododecanoic acid (PFDoA)	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.00009	U	0.00009	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00009	U	0.00010	U	0.0001	U	0.0001	U	~	~	~
Perfluoroheptanoic acid (PFHpA)	0.00011	U	0.00012	U	0.0001	U	0.0001	U	0.00012	U	0.00012	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00012	U	0.00013	U	0.0001	U	0.0001	U	~	~	~
Perfluorohexanesulfonic acid (PFHxS)	0.00007	U	0.00007	U	0.0001	U	0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	~	~	~
Perfluorohexanoic acid (PFHxA)	0.00005	U	0.00005	U	0.0001	U	0.0001	U	0.00006	U	0.00005	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00006	U	0.00006	U	0.0001	U	0.0001	U	~	~	~
Perfluoro-n-butanoic acid (PFBA)	0.00017	U	0.00017	U	0.0002	U	0.0002	U	0.00018	U	0.00017	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.00018	U	0.00019	U	0.0002	U	0.0002	U	~	~	~
Perfluorononanoic acid (PFNA)	0.00015	U	0.00015	U	0.0001	U	0.0001	U	0.00016	U	0.00015	U	0.0001	U	0.0002	U	0.0002	U	0.0001	U	0.00015	U	0.00017	U	0.0002	U	0.0001	U	~	~	~
Perfluorooctanesulfonic acid (PFOS)	0.00007	U	0.00007	U	**0.0001**	**J**	0.0001	U	**0.00073**		0.00008	U	0.0001	U	0.0001	U	**0.0004**		0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.00088	0.044	0.001
Perfluorooctanoic acid (PFOA)	0.00007	U	**0.00010**	J	**0.0001**	**J**	0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.0007		0.0001	U	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.00066	0.033	0.0008
Perfluoropentanoic acid (PFPeA)	0.00008	U	0.00008	U	0.0001	U	0.0001	U	0.00009	U	0.00009	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00009	U	0.00010	U	0.0001	U	0.0001	U	~	~	~
Perfluorotetradecanoic acid (PFTA)	0.00014	U	0.00014	U	0.0001	U	0.0001	U	0.00014	U	0.00014	U	0.0001	U	0.0001	U	0.0002	U	0.0001	U	0.00014	U	0.00016	U	0.0001	U	0.0001	U	~	~	~
Perfluorotridecanoic acid (PFTrDA)	0.00011	U	0.00012	U	0.0001	U	0.0001	U	0.00012	U	0.00012	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00012	U	0.00013	U	0.0001	U	0.0001	U	~	~	~
Perfluoroundecanoic acid (PFUnA)	0.00011	U	0.00012	U	0.0001	U	0.0001	U	0.00012	U	0.00012	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.00012	U	0.00013	U	0.0001	U	0.0001	U	~	~	~

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
~=No standard available for target analyte
EB=equipment blank
UUSCOS=NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOS=NYSDEC Part 375 Restricted Use Soil Cleanup Objectives -Restricted Residential
Bolded indicates concentration is greater than MDL
(1)= NYSDEC Guidance Values for Anticipated Site Use in accordance with Sampling, Analysis, And Assessment Of Per- And Polyfluoroalkyl -Substances (PFAS) - April 2023
indicates concentration exceeds PFO Unrestricted Site Use

Table 5
Groundwater Samples Analytical Results - VOCs
3083 Webster Avenue, Bronx, New York

Sample ID	MW-1a		MW-3a		MW-4a		MW-5a		MW-6		MW-7		MW-8		MW-9		AWQS - TOGS 1.1.1
Sampling Date	8/6/2025		8/5/2025		8/7/2025		8/5/2025		8/5/2025		8/7/2025		8/6/2025		8/7/2025		
Client Matrix	Water		Water		Water		Water		Water		Water		Water		Water		
Compound	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	
Units	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L
1,1,1,2-Tetrachloroethane	0.216	U	0.216	U	0.216	U	0.216	U	0.216	U	0.216	U	0.216	U	0.216	U	5
1,1,1-Trichloroethane	0.266	U	0.266	U	0.266	U	0.266	U	0.266	U	0.266	U	0.266	U	0.266	U	5
1,1,2,2-Tetrachloroethane	0.256	U	0.256	U	0.256	U	0.256	U	0.256	U	0.256	U	0.256	U	0.256	U	5
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	0.286	U	0.286	U	0.286	U	0.286	U	0.286	U	0.286	U	0.286	U	0.286	U	5
1,1,2-Trichloroethane	0.249	U	0.249	U	0.249	U	0.249	U	0.249	U	0.249	U	0.249	U	0.249	U	1
1,1-Dichloroethane	0.272	U	0.272	U	0.272	U	0.272	U	0.272	U	0.272	U	0.272	U	0.272	U	5
1,1-Dichloroethylene	0.327	U	0.327	U	0.327	U	0.327	U	0.327	U	0.327	U	0.327	U	0.327	U	5
1,2,3-Trichlorobenzene	0.222	U	0.222	U	0.222	U	0.222	U	0.222	U	0.222	U	0.222	U	0.222	U	5
1,2,3-Trichloropropane	0.273	U	0.273	U	0.273	U	0.273	U	0.273	U	0.273	U	0.273	U	0.273	U	0.04
1,2,4-Trichlorobenzene	0.138	U	0.138	U	0.138	U	0.138	U	0.138	U	0.138	U	0.138	U	0.138	U	5
1,2,4-Trimethylbenzene	0.31	U	0.31	U	**246**	D	0.31	U	0.31	U	**26.2**		0.31	U	**0.81**		5
1,2-Dibromo-3-chloropropane	0.432	U	0.432	U	0.432	U	0.432	U	0.432	U	0.432	U	0.432	U	0.432	U	0.04
1,2-Dibromoethane	0.215	U	0.215	U	0.215	U	0.215	U	0.215	U	0.215	U	0.215	U	0.215	U	0.0006
1,2-Dichlorobenzene	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	3
1,2-Dichloroethane	0.377	U	0.377	U	0.377	U	0.377	U	0.377	U	0.377	U	0.377	U	0.377	U	0.6
1,2-Dichloropropane	0.327	U	0.327	U	0.327	U	0.327	U	0.327	U	0.327	U	0.327	U	0.327	U	1
1,3,5-Trimethylbenzene	0.347	U	0.347	U	**66.80**		0.347	U	0.347	U	0.347	U	0.347	U	0.347	U	5
1,3-Dichlorobenzene	0.283	U	0.283	U	0.283	U	0.283	U	0.283	U	0.283	U	0.283	U	0.283	U	3
1,4-Dichlorobenzene	0.311	U	0.311	U	0.311	U	0.311	U	0.311	U	0.311	U	0.311	U	0.311	U	3
2-Butanone	0.421	U	0.421	U	0.421	U	0.421	U	0.421	U	0.421	U	0.421	U	0.421	U	50
2-Hexanone	0.32	U	0.32	U	0.32	U	0.32	U	0.32	U	0.32	U	0.32	U	0.32	U	50
4-Methyl-2-pentanone	0.365	U	0.365	U	0.365	U	0.365	U	0.365	U	0.365	U	0.365	U	0.365	U	~
Acetone	1.34	U	1.34	U	**4.1**		1.34	U	**1.65**	J	**1.92**	J	1.34	U	**2.27**		50
Acrolein	0.447	U	0.447	U	0.447	U	0.447	U	0.447	U	**1.05**		0.447	U	0.447	U	5
Acrylonitrile	0.422	U	0.422	U	0.422	U	0.422	U	0.422	U	0.422	U	0.422	U	0.422	U	~
Benzene	0.279	U	0.279	U	0.279	U	0.279	U	0.279	U	0.279	U	0.279	U	0.279	U	1
Bromochloromethane	0.354	U	0.354	U	0.354	U	0.354	U	0.354	U	0.354	U	0.354	U	0.354	U	5
Bromodichloromethane	0.245	U	0.245	U	0.245	U	0.245	U	0.245	U	0.245	U	0.245	U	0.245	U	50
Bromoform	0.163	U	0.163	U	0.163	U	0.163	U	0.163	U	0.163	U	0.163	U	0.163	U	50
Bromomethane	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	5
Carbon disulfide	0.362	U	0.362	U	0.362	U	0.362	U	0.362	U	0.362	U	0.362	U	0.362	U	~
Carbon tetrachloride	0.204	U	0.204	U	0.204	U	0.204	U	0.204	U	0.204	U	0.204	U	0.204	U	5
Chlorobenzene	0.284	U	0.284	U	0.284	U	0.284	U	0.284	U	0.284	U	0.284	U	0.284	U	5
Chloroethane	0.448	U	0.448	U	0.448	U	0.448	U	0.448	U	0.448	U	0.448	U	0.448	U	5
Chloroform	**3.1**		0.243	U	0.243	U	**0.53**		**0.7**		**2.94**		**0.36**	J	**4.7**		7
Chloromethane	0.372	U	0.372	U	0.372	U	0.372	U	0.372	U	0.372	U	0.372	U	0.372	U	5
cis-1,2-Dichloroethylene	**2.28**		**0.88**		**1.35**		0.294	U	0.294	U	**3.33**		**0.3**	J	0.294	U	5
cis-1,3-Dichloropropylene	0.262	U	0.262	U	0.262	U	0.262	U	0.262	U	0.262	U	0.262	U	0.262	U	0.4
Cyclohexane	0.491	U	0.491	U	**70.6**		0.491	U	**1.97**		**1.19**		0.491	U	0.491	U	~
Dibromochloromethane	0.146	U	0.146	U	0.146	U	0.146	U	0.146	U	0.146	U	0.146	U	0.146	U	50
Dibromomethane	0.203	U	0.203	U	0.203	U	0.203	U	0.203	U	0.203	U	0.203	U	0.203	U	~
Dichlorodifluoromethane	0.451	U	0.451	U	0.451	U	0.451	U	0.451	U	0.451	U	0.451	U	0.451	U	5
Ethyl Benzene	0.29	U	0.29	U	**68.4**		0.29	U	0.29	U	**4.28**		0.29	U	0.29	U	5
Hexachlorobutadiene	0.241	U	0.241	U	0.241	U	0.241	U	0.241	U	0.241	U	0.241	U	0.241	U	0.5
Isopropylbenzene	0.405	U	0.405	U	**66.5**		0.405	U	0.405	U	**4.22**		0.405	U	0.405	U	5
Methyl acetate	0.442	U	0.442	U	0.442	U	0.442	U	0.442	U	0.442	U	0.442	U	0.442	U	~
Methyl tert-butyl ether (MTBE)	0.244	U	0.244	U	0.244	U	0.244	U	0.244	U	0.244	U	0.244	U	0.244	U	10
Methylcyclohexane	0.477	U	0.477	U	**28.2**		0.477	U	0.477	U	**0.77**		0.477	U	0.477	U	~
Methylene chloride	0.397	U	0.397	U	0.397	U	0.397	U	0.397	U	**0.66**	J	0.397	U	0.397	U	5
n-Butylbenzene	0.399	U	0.399	U	**34.8**		0.399	U	0.399	U	**1.03**		0.399	U	0.399	U	5
n-Propylbenzene	0.384	U	0.384	U	**170**	D	0.384	U	0.384	U	**12.2**		0.384	U	**0.52**		5
o-Xylene	0.261	U	0.261	U	**1.9**		0.261	U	0.261	U	0.261	U	0.261	U	0.261	U	5
p- & m- Xylenes	0.578	U	0.578	U	**96**		0.578	U	0.578	U	**1.81**		0.578	U	0.578	U	5
p-Isopropyltoluene	0.377	U	0.377	U	**4.23**		0.377	U	0.377	U	0.377	U	0.377	U	0.377	U	5
sec-Butylbenzene	0.444	U	0.444	U	**23.80**		0.444	U	0.444	U	**1.01**		0.444	U	0.444	U	5
Styrene	0.255	U	0.255	U	0.255	U	0.255	U	0.255	U	0.255	U	0.255	U	0.255	U	5
tert-Butyl alcohol (TBA)	0.608	U	0.608	U	0.608	U	0.608	U	0.608	U	**0.62**	J	0.608	U	0.608	U	~
tert-Butylbenzene	0.367	U	0.367	U	**0.52**		0.367	U	0.367	U	0.367	U	0.367	U	0.367	U	5
Tetrachloroethylene	**7.33**		0.239	U	**1.44**		**0.29**	J	0.239	U	**10.5**		**3.01**		**0.24**	J	5
Toluene	0.346	U	0.346	U	**0.36**	J	0.346	U	0.346	U	0.346	U	0.346	U	**5.85**		5
trans-1,2-Dichloroethylene	0.279	U	0.279	U	0.279	U	0.279	U	0.279	U	0.279	U	0.279	U	0.279	U	5
trans-1,3-Dichloropropylene	0.229	U	0.229	U	0.229	U	0.229	U	0.229	U	0.229	U	0.229	U	0.229	U	0.4
trans-1,4-dichloro-2-butene	0.283	U	0.283	U	0.283	U	0.283	U	0.283	U	0.283	U	0.283	U	0.283	U	~
Trichloroethylene	**3.55**		0.249	U	**2.02**		0.249	U	0.249	U	**4.35**		**1.8**		0.249	U	5
Trichlorofluoromethane	0.337	U	0.337	U	0.337	U	0.337	U	0.337	U	0.337	U	0.337	U	0.337	U	5
Vinyl Chloride	0.469	U	0.469	U	0.469	U	0.469	U	0.469	U	0.469	U	0.469	U	0.469	U	2

NOTES:
Q is the Qualifier Column with definitions as follows:
D=result is from an analysis that required a dilution
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated
~=this indicates that no regulatory limit has been established for this analyte
AWQS - TOGS 1.1.1=NYSDEC 6 NYCRR Part 703 Ambient Water Quality Standards - Technical and Operational Guidance Series 1.1.1.
value exceeds AWQS

Table 5 (Cont.)
Groundwater Samples Analytical Results - SVOCs
3083 Webster Avenue, Bronx, New York

Sample ID	MW-1a		MW-2a		MW-3a		MW-4a		MW-5a		MW-6		MW-7		MW-8		MW-9		AWQS - TOGS 1.1.1
Sampling Date	8/6/2025		8/6/2025		8/5/2025		8/7/2025		8/5/2025		8/5/2025		8/7/2025		8/6/2025		8/7/2025		
Client Matrix	Water		Water		Water		Water		Water		Water		Water		Water		Water		
Compound	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	
Units	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L
1,1-Biphenyl	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
1,2,4,5-Tetrachlorobenzene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
1,2,4-Trichlorobenzene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
1,2-Dichlorobenzene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	3
1,2-Diphenylhydrazine (as Azobenz	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
1,3-Dichlorobenzene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	3
1,4-Dichlorobenzene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	3
2,3,4,6-Tetrachlorophenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
2,4,5-Trichlorophenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1
2,4,6-Trichlorophenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1
2,4-Dichlorophenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
2,4-Dimethylphenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
2,4-Dinitrophenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	10
2,4-Dinitrotoluene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
2,6-Dinitrotoluene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
2-Chloronaphthalene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	10
2-Chlorophenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1
2-Methylnaphthalene	2.5	U	2.5	U	2.5	U	**10.8**		2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
2-Methylphenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1
2-Nitroaniline	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
2-Nitrophenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1
3- & 4-Methylphenols	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
3,3-Dichlorobenzidine	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
3-Nitroaniline	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
4,6-Dinitro-2-methylphenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
4-Bromophenyl phenyl ether	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
4-Chloro-3-methylphenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1
4-Chloroaniline	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
4-Chlorophenyl phenyl ether	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
4-Nitroaniline	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
4-Nitrophenol	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	1
Acenaphthene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	20
Acenaphthylene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Acetophenone	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Aniline	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
Anthracene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Atrazine	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Benzaldehyde	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Benzidine	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	~
Benzo(a)anthracene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	0.002
Benzo(a)pyrene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	0.002
Benzo(b)fluoranthene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	0.002
Benzo(g,h,i)perylene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Benzo(k)fluoranthene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	0.002
Benzoic acid	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Benzyl alcohol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Benzyl butyl phthalate	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Bis(2-chloroethoxy)methane	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
Bis(2-chloroethyl)ether	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1
Bis(2-chloroisopropyl)ether	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
Bis(2-ethylhexyl)phthalate	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
Caprolactam	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Carbazole	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Chrysene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	0.002
Dibenzo(a,h)anthracene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Dibenzofuran	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Diethyl phthalate	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Dimethyl phthalate	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Di-n-butyl phthalate	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Di-n-octyl phthalate	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Diphenylamine	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
Fluoranthene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Fluorene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Hexachlorobenzene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	0.04
Hexachlorobutadiene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	0.5
Hexachlorocyclopentadiene	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Hexachloroethane	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	5
Indeno(1,2,3-cd)pyrene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	0.002
Isophorone	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Naphthalene	2.5	U	2.5	U	2.5	U	**13.3**		2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	10
Nitrobenzene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	0.4
N-Nitrosodimethylamine	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
N-nitroso-di-n-propylamine	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	~
N-Nitrosodiphenylamine	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Pentachlorophenol	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1
Phenanthrene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Phenol	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	1
Pyrene	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50
Pyridine	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	50

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
~=this indicates that no regulatory limit has been established for this analyte
AWQS - TOGS 1.1.1=NYSDEC 6 NYCRR Part 703 Ambient Water Quality Standards - Technical and Operational Guidance Series 1.1.1.
value exceeds AWQS

Table 5 (Cont.)
Groundwater Samples Analytical Results - Pesticides, Herbicides and PCBs
3083 Webster Avenue, Bronx, New York

Sample ID	MW-1a		MW-4a		MW-5a		MW-6		MW-7		MW-8		MW-9		AWQS - TOGS 1.1.1
Sampling Date	8/6/2025		8/7/2025		8/5/2025		8/5/2025		8/7/2025		8/6/2025		8/7/2025		
Client Matrix	Water		Water		Water		Water		Water		Water		Water		
Compound	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	
Units	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L
Pesticides															
4,4'-DDD	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.3
4,4'-DDE	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.2
4,4'-DDT	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.2
Aldrin	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	~
alpha-BHC	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.01
alpha-Chlordane	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	~
beta-BHC	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.04
Chlordane, total	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.05
delta-BHC	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.04
Dieldrin	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.004
Endosulfan I	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	~
Endosulfan II	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	~
Endosulfan sulfate	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	~
Endrin	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	~
Endrin aldehyde	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	5
Endrin ketone	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	5
gamma-BHC (Lindane)	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.05
gamma-Chlordane	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	~
Heptachlor	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.04
Heptachlor epoxide	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.03
Methoxychlor	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	0.004	U	35
Toxaphene	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.06
Herbicides															
2,4,5-T	5	U	5	U	5	U	5	U	5	U	5	U	5	U	35
2,4,5-TP (Silvex)	5	U	5	U	5	U	5	U	5	U	5	U	5	U	0.26
2,4-D	5	U	5	U	5	U	5	U	5	U	5	U	5	U	50
Polychlorinated Biphenyls (PCB)															
Aroclor 1016	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	~
Aroclor 1221	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	~
Aroclor 1232	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	~
Aroclor 1242	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	~
Aroclor 1248	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	~
Aroclor 1254	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	~
Aroclor 1260	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	~
Total PCBs	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.09

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
~=this indicates that no regulatory limit has been established for this analyte
AWQS - TOGS 1.1.1=NYSDEC 6 NYCRR Part 703 Ambient Water Quality Standards - Technical and Operational Guidance Series 1.1.1.

Table 5 (Cont.)
Groundwater Samples Analytical Results in - Metals
3083 Webster Avenue, Bronx, New York

Sample ID	MW-1a		MW-3a		MW-4a		MW-5a		MW-6		MW-7		MW-8		MW-9		AWQS - TOGS 1.1.1
Sampling Date	8/6/2025		8/5/2025		8/7/2025		8/5/2025		8/5/2025		8/7/2025		8/6/2025		8/7/2025		
Client Matrix	Water		Water		Water		Water		Water		Water		Water		Water		
Compound	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	
Units	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L
Metals, Total																	
Aluminum	556	U	**2,090**		556	U	556	U	556	U	556	U	556	U	**1,450**		~
Antimony	1	U	1	U	1	U	1	U	**0.300**	J	1	U	1	U	**0.6**	J	~
Arsenic	1	U	1	U	1	U	1	U	1	U	1	U	1	U	**0.5**	J	~
Barium	**91**		**126**		**97.60**		**68.30**		**48**		**70.40**		**53.90**		**184**		1,000
Beryllium	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	~
Cadmium	1	U	1	U	1	U	1	U	1	U	1	U	**0.200**	J	1	U	~
Calcium	33,000		**64,900**		**42,400**		**50,200**		**67,400**		**40,500**		**37,000**		**39,500**		~
Chromium, Hexavalent	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	50
Chromium, Trivalent	5.56	U	5.56	U	5.56	U	5.56	U	**10.10**		5.56	U	5.56	U	**9**		50
Cobalt	4.44	U	**4.56**		4.44	U	4.44	U	4.44	U	4.44	U	4.44	U	**8.33**		~
Copper	22.2	U	22.2	U	22.2	U	22.2	U	22.2	U	22.2	U	22.2	U	22.2	U	200
Iron	278	U	**2,790**		**1,230**		278	U	**313**		**771**		278	U	**1,570**		~
Lead	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	25
Magnesium	**7,610**		**17,100**		**14,200**		**15,500**		**10,300**		**10,900**		**8,830**		**10,500**		35,000
Manganese	**130**		**1,200**		**1,730**		**303**		**13.7**		**500**		**21.4**		**263**		300
Mercury	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.8**		0.2	U	0.2	U	0.7
Nickel	11.1	U	**13.2**		11.1	U	**14.1**		11.1	U	11.1	U	**31**		**14.8**		100
Potassium	**5,730**		**11,900**		**6,600**		**9,300**		**9,690**		**6,640**		**7,000**		**14,200**		~
Selenium	**5.1**		1.300	J	2	U	**3.7**		**2**		**2.9**		1.7	J	**5.4**		~
Silver	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	50
Sodium	**18,700**		**54,000**		**38,400**		**34,700**		**46,700**		**29,000**		**29,500**		**25,300**		20,000
Thallium	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	~
Vanadium	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	~
Zinc	27.8	U	**41**		27.8	U	**35.3**		**47.3**		27.8	U	**76.2**		27.8	U	2,000
Metals, Dissolved																	
Aluminum	556	U	556	U	556	U	556	U	556	U	556	U	556	U	556	U	~
Antimony	1	U	1	U	1	U	1	U	**0.3**	J	1	U	1	U	**0.7**	J	~
Arsenic	1	U	1	U	1	U	1	U	1	U	1	U	1	U	**0.5**	J	~
Barium	**85.2**		**102**		**92.9**		**65.4**		**43.4**		**65.4**		**51.1**		**170**		1,000
Beryllium	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	~
Cadmium	1	U	1	U	1	U	1	U	1	U	1	U	**0.20**	J	1	U	~
Calcium	**32,400**		**64,000**		**43,100**		**50,600**		**63,100**		**41,500**		**36,100**		**40,100**		~
Chromium	5.56	U	5.56	U	5.56	U	5.56	U	**7.89**		5.56	U	5.56	U	5.56	U	50
Cobalt	4.44	U	4.44	U	4.44	U	4.44	U	4.44	U	4.44	U	4.44	U	**8.44**		~
Copper	22.2	U	22.2	U	22.2	U	22.2	U	22.2	U	22.2	U	22.2	U	22.2	U	200
Iron	278	U	278	U	278	U	278	U	278	U	278	U	278	U	278	U	~
Lead	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	25
Magnesium	**7,490**		**16,400**		**14,400**		**15,700**		**10,900**		**11,100**		**8,800**		**9,860**		35,000
Manganese	**113**		**1,130**		**1,740**		**272**		**6.22**		**505**		**19.1**		**256**		300
Mercury	0.2	U	0.2	U	**0.2**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.7
Nickel	11.1	U	11.1	U	11.1	U	**14.7**		11.1	U	11.1	U	**30.1**		**11.1**		100
Potassium	**5,810**		**11,400**		**6,730**		**9,280**		**9,790**		**6,820**		**7,100**		**14,300**		~
Selenium	**5.5**		**1.5**	J	2	U	**3.3**		**2**		**2.7**		**1.6**	J	**5.4**		~
Silver	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	6.67	U	50
Sodium	**17,800**		**53,100**		**39,200**		**33,800**		**46,900**		**29,600**		**29,200**		**25,400**		20,000
Thallium	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	~
Vanadium	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	~
Zinc	27.8	U	**58.7**		27.8	U	**57.7**		**71**		**29.1**		**36**		**42.2**		2,000

NOTES:
Q is the Qualifier Column with definitions as follows:
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated
~=this indicates that no regulatory limit has been established for this analyte
AWQS - TOGS 1.1.1=NYSDEC 6 NYCRR Part 703 Ambient Water Quality Standards - Technical and Operational Guidance Series 1.1.1.
value exceeds AWQS

Table 5 (Cont.)
Groundwater Samples Analytical Results - Emerging Contaminants
3083 Webster Avenue, Bronx, New York

Sample ID	MW-1a		MW-3a		MW-4a		MW-5a		MW-6		MW-7		MW-8		MW-9		AWQS - TOGS 1.1.1 [1]
Sampling Date	8/6/2025		8/5/2025		8/7/2025		8/5/2025		8/5/2025		8/7/2025		8/6/2025		8/7/2025		
Client Matrix	Water		Water		Water		Water		Water		Water		Water		Water		
Compound	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	
Units	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		
1,4-Dioxane																	
1,4-Dioxane	0.3	U	**0.416**		0.3	U	**0.608**		0.3	U	0.3	U	0.3	U	0.3	U	0.35
PFAS																	AWQS - PFOA/PFOS [2]
11CL-PF3OUdS	0.00214	U	0.00212	U	0.00213	U	0.00214	U	0.00212	U	0.00214	U	0.00212	U	0.00217	U	~
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	0.00216	U	0.00214	U	0.00215	U	0.00216	U	0.00213	U	0.00216	U	0.00213	U	0.00219	U	~
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	0.0027	U	0.00269	U	0.00269	U	0.00271	U	0.00268	U	0.00271	U	0.00268	U	0.00274	U	~
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.00222	U	0.00221	U	0.00221	U	0.00223	U	0.0022	U	0.00223	U	0.0022	U	**0.0251**		~
2H,2H,3H,3H-Perfluorodecanoic acid (7:3FTCA)	0.0221	U	0.022	U	0.022	U	0.0222	U	0.0219	U	0.0221	U	0.0219	U	0.0224	U	~
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	0.00645	U	0.00641	U	0.00642	U	0.00647	U	0.00639	U	0.00646	U	0.00639	U	0.00655	U	~
4,4,5,5,6,6,6-Heptafluorohexanoic acid (3:3FTCA)	0.00226	U	0.00225	U	0.00225	U	0.00227	U	0.00224	U	0.00226	U	0.00224	U	0.0023	U	~
9CL-PF3ONS	0.00263	U	0.00262	U	0.00262	U	0.00264	U	0.00261	U	0.00264	U	0.00261	U	0.00268	U	~
ADONA	0.00284	U	0.00283	U	0.00283	U	0.00286	U	0.00282	U	0.00285	U	0.00282	U	0.00289	U	~
HFPO-DA (Gen-X)	0.00301	U	0.00299	U	0.003	U	0.00302	U	0.00298	U	0.00301	U	0.00298	U	0.00305	U	~
N-EtFOSA	0.00101	U	0.001	U	0.001	U	0.00101	U	0.001	U	0.00101	U	0.001	U	0.00102	U	~
N-EtFOSAA	0.00101	U	0.001	U	0.001	U	0.00101	U	0.001	U	0.00101	U	0.001	U	0.00102	U	~
N-EtFOSE	0.00697	U	0.00693	U	0.00695	U	**0.0070**	J	0.00691	U	0.00699	U	0.00691	U	0.00708	U	~
N-MeFOSA	0.00068	U	0.00068	U	0.00068	U	0.00068	U	0.00067	U	0.00068	U	0.00067	U	0.00069	U	~
N-MeFOSAA	0.00048	U	0.00048	U	0.00048	U	0.00048	U	0.00047	U	0.00048	U	0.00047	U	0.00049	U	~
N-MeFOSE	0.0068	U	0.00676	U	0.00677	U	0.00683	U	0.00674	U	0.00681	U	0.00674	U	0.00691	U	~
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	0.00048	U	0.00048	U	0.00048	U	0.00048	U	0.00047	U	0.00048	U	0.00047	U	0.00049	U	~
Perfluoro-1-decanesulfonic acid (PFDS)	0.00059	U	0.00059	U	0.00059	U	0.0006	U	**0.0008**	J	0.0006	U	0.00059	U	0.0006	U	~
Perfluoro-1-heptanesulfonic acid (PFHpS)	**0.0011**	J	**0.0010**	J	0.0003	U	**0.0007**	J	0.00029	U	**0.0005**	J	0.00029	U	0.0003	U	~
Perfluoro-1-nonanesulfonic acid (PFNS)	0.00072	U	0.00071	U	0.00072	U	0.00072	U	0.00071	U	0.00072	U	0.00071	U	0.00073	U	~
Perfluoro-1-octanesulfonamide (FOSA)	0.00035	U	**0.0009**	J	0.00035	U	0.00036	U	**0.0006**	J	0.00036	U	**0.0007**	J	**0.0010**	J	~
Perfluoro-1-pentanesulfonate (PFPeS)	0.00072	U	**0.0008**	J	0.00072	U	0.00072	U	0.00071	U	0.00072	U	0.00071	U	0.00073	U	~
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	0.00287	U	0.00286	U	0.00286	U	0.00288	U	0.00285	U	0.00288	U	0.00285	U	0.00292	U	~
Perfluoro-4-oxapentanoic acid (PFMPA)	0.00067	U	0.00067	U	0.00067	U	0.00067	U	0.00066	U	0.00067	U	0.00066	U	0.00068	U	~
Perfluoro-5-oxahexanoic acid (PFMBA)	0.00134	U	0.00133	U	0.00134	U	0.00135	U	0.00133	U	0.00134	U	0.00133	U	0.00136	U	~
Perfluorobutanesulfonic acid (PFBS)	**0.0070**		**0.0052**		**0.0051**		**0.0035**		**0.0044**		**0.0055**		**0.0035**		**0.0025**		~
Perfluorodecanoic acid (PFDA)	**0.0011**	J	**0.0012**	J	**0.001**	J	**0.0009**	J	**0.0012**	J	**0.0009**	J	**0.0007**	J	0.00055	U	~
Perfluorododecanesulfonic acid (PFDoS)	0.00085	U	0.00085	U	0.00085	U	0.00086	U	0.00084	U	0.00085	U	0.00084	U	0.00087	U	~
Perfluorododecanoic acid (PFDoA)	0.00058	U	0.00057	U	0.00057	U	0.00058	U	0.00057	U	0.00058	U	0.00057	U	0.00058	U	~
Perfluoroheptanoic acid (PFHpA)	**0.0163**		**0.0129**		**0.0109**		**0.0044**		**0.0072**		**0.0079**		**0.0038**		**0.0051**		~
Perfluorohexanesulfonic acid (PFHxS)	**0.0036**		**0.0044**		**0.0027**		**0.0027**		**0.0030**		**0.0024**		**0.0018**		**0.0014**	J	~
Perfluorohexanoic acid (PFHxA)	**0.0363**		**0.1570**		**0.0516**		**0.0212**		**0.0614**		**0.0242**		**0.0097**		**0.0061**		~
Perfluoro-n-butanoic acid (PFBA)	**0.0225**	JD	**0.0345**		**0.8080**	D	**0.0112**		**0.0214**		**0.0080**		0.0155	U	0.0159	U	~
Perfluorononanoic acid (PFNA)	**0.0035**		**0.0029**		**0.0031**		**0.0027**		**0.0044**		**0.0027**		**0.0018**	J	**0.0016**	J	~
Perfluorooctanesulfonic acid (PFOS)	**0.0301**		**0.0353**		**0.0369**		**0.0289**		**0.0259**		**0.0274**		**0.0119**		**0.0168**		0.0027
Perfluorooctanoic acid (PFOA)	**0.0340**		**0.0245**		**0.0226**		**0.0151**		**0.0209**		**0.0223**		**0.0104**		**0.0124**		0.0067
Perfluoropentanoic acid (PFPeA)	**0.0458**		**0.1550**		**0.0531**		**0.0248**		**0.0777**		**0.0257**		**0.0164**		**0.0064**		~
Perfluorotetradecanoic acid (PFTA)	0.00151	U	0.0015	U	0.00151	U	0.00152	U	0.0015	U	0.00152	U	0.0015	U	0.00154	U	~
Perfluorotridecanoic acid (PFTrDA)	0.00115	U	0.00114	U	0.00115	U	0.00115	U	0.00114	U	0.00115	U	0.00114	U	0.00117	U	~
Perfluoroundecanoic acid (PFUnA)	0.00068	U	0.00068	U	0.00068	U	0.00068	U	0.00067	U	0.00068	U	0.00067	U	0.00069	U	~

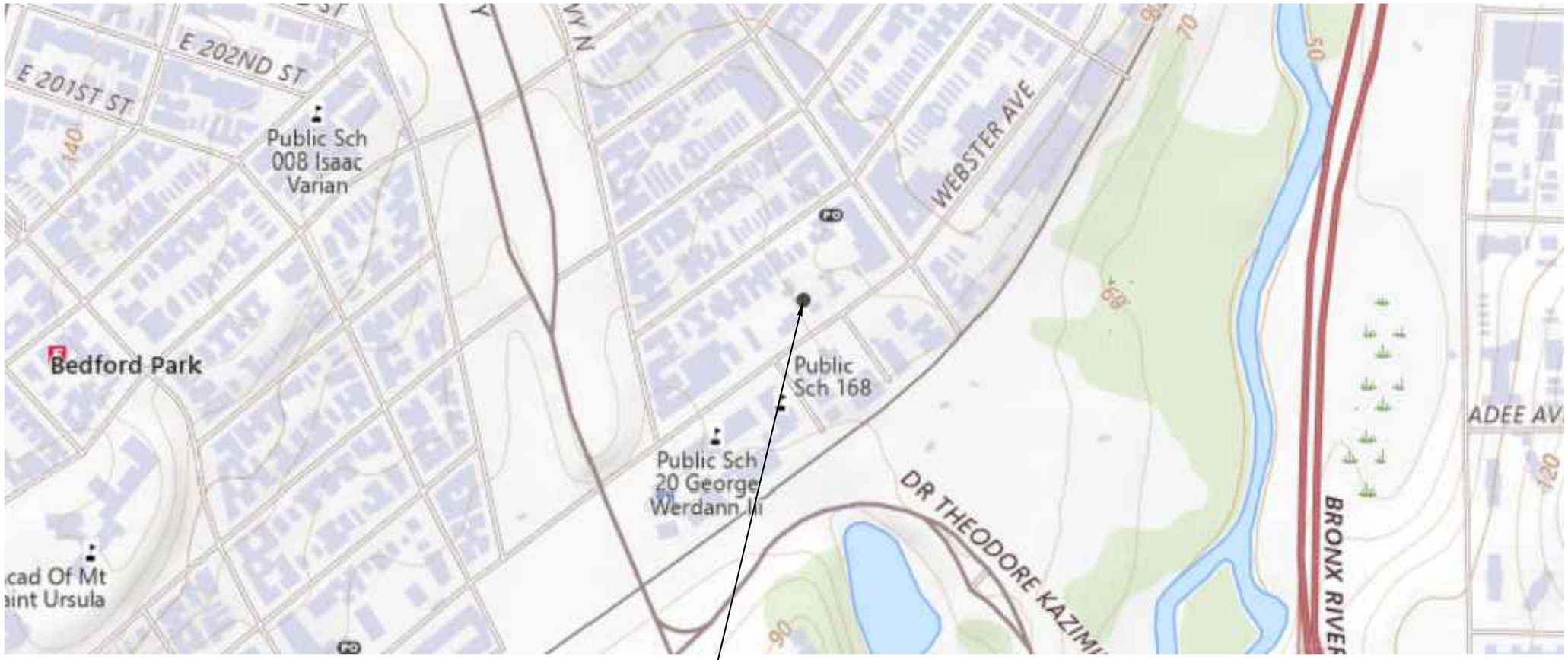
NOTES:
Q is the Qualifier Column with definitions as follows:
D=result is from an analysis that required a dilution
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated
~=this indicates that no regulatory limit has been established for this analyte
(1) AWQS - TOGS 1.1.1= NYSDEC 6 NYCRR Part 703 Ambient Water Quality Standards - Technical and Operational Guidance Series 1.1.1.
(2) AWQS - PFOA/PFOS = NYSDEC Ambient Water Quality Guidance Values for PFOA and PFOS - April 2023
value exceeds its AWQS

Table 6
Soil Vapor Samples Analytical Results
3083 Webster Avenue, Bronx, NY

Sample ID	SV-1R-I		SV-1R-D		SV-2R-I		SV-2R-D		SV-3R		SV-4R-I		SV-4R-D		SV-5R-I		SV-5R-D		SV-6		SV-7-I		SV-7-DUP		SV-7-D	
Sample depth	7 feet		14 feet		6.5 feet		13 feet		7 feet		7.5 feet		13 feet		8.5 feet		17 feet		8 feet		5 feet		10 feet		10 feet	
Sampling Date	7/24/2025		7/24/2025		7/24/2025		7/24/2025		7/24/2025		7/24/2025		7/24/2025		7/24/2025		7/24/2025		7/24/2025		7/24/2025		7/24/2025		7/24/2025	
Client Matrix	Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor	
Compound	Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Units	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q	ug/m3	Q
1,1,1,2-Tetrachloroethane	6.1	U	5.0	U	6.40	U	6.6	U	2.5	U	2.6	U	12.0	U	6.1	U	2.7	U	1.20	U	2.1	U	2.5	U	6.7	U
1,1,1-Trichloroethane	4.90	U	4.00	U	5.10	U	5.2	U	2.00	U	2.00	U	9.20	U	4.90	U	2.10	U	0.96	U	3.3	D	3.60	D	5.30	U
1,1,2,2-Tetrachloroethane	6.1	U	5.0	U	6.40	U	6.6	U	2.5	U	2.6	U	12.0	U	6.1	U	2.7	U	1.20	U	2.1	U	2.5	U	6.7	U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	6.8	U	5.6	U	7.2	U	7.4	U	2.8	U	2.9	U	13.0	U	6.8	U	3.0	U	1.3	U	2.3	U	2.8	U	7.4	U
1,1,2-Trichloroethane	4.90	U	4.00	U	5.10	U	5.2	U	2.00	U	2.00	U	9.20	U	4.90	U	2.10	U	0.96	U	1.6	U	2.00	U	5.30	U
1,1-Dichloroethane	3.60	U	3.00	U	3.80	U	3.9	U	1.50	U	1.50	U	6.80	U	3.60	U	1.60	U	0.71	U	1.2	U	1.50	U	3.90	U
1,1-Dichloroethylene	1.80	U	1.50	U	1.90	U	1.90	U	0.73	U	0.74	U	3.30	U	1.80	U	0.78	U	0.35	U	0.59	U	0.73	U	1.90	U
1,2,4-Trichlorobenzene	330.0	U	270.0	U	350.0	U	360.0	U	140.0	U	140.0	U	620.0	U	330.0	U	150.0	U	65.0	U	110.0	U	140.0	U	360.0	U
1,2,4-Trimethylbenzene	**5.7**	**D**	**6.5**	**D**	**6.0**	**D**	**6.1**	**D**	**4.7**	**D**	**4.8**	**D**	**120**	**D**	**4.8**	**D**	**4.8**	**D**	**8**	**D**	**4**	**D**	**4.7**	**D**	4.8	U
1,2-Dibromoethane	6.9	U	5.6	U	7.2	U	7.4	U	2.8	U	2.9	U	13.0	U	6.8	U	3.0	U	1.4	U	2.3	U	2.8	U	7.5	U
1,2-Dichlorobenzene	5.40	U	4.40	U	5.60	U	5.8	U	2.20	U	2.20	U	10.00	U	5.40	U	2.40	U	1.10	U	1.8	U	2.20	U	5.80	U
1,2-Dichloroethane	3.60	U	3.00	U	3.80	U	3.9	U	1.50	U	1.50	U	6.80	U	3.60	U	1.60	U	0.71	U	1.2	U	1.50	U	3.90	U
1,2-Dichloropropane	4.10	U	3.40	U	4.30	U	4.4	U	1.70	U	1.70	U	7.80	U	4.10	U	1.80	U	0.81	U	1.4	U	1.70	U	4.50	U
1,2-Dichlorotetrafluoroethane	6.2	U	5.1	U	6.5	U	6.7	U	2.6	U	2.6	U	12.0	U	6.2	U	2.7	U	1.2	U	2.1	U	2.6	U	6.8	U
1,3,5-Trimethylbenzene	4.4	U	3.6	U	4.6	U	4.7	U	**2.7**	**D**	**2.4**	**D**	**200**	**D**	4.4	U	**1.9**	**D**	**3.4**	**D**	**1.9**	**D**	**2.0**	**D**	4.8	U
1,3-Butadiene	5.90	U	4.9	U	6.20	U	6.4	U	2.5	U	2.5	U	11.00	U	5.90	U	2.6	U	1.20	U	2.0	U	2.5	U	6.4	U
1,3-Dichlorobenzene	5.40	U	4.40	U	5.60	U	5.8	U	2.20	U	2.20	U	10.00	U	5.40	U	2.40	U	1.10	U	1.8	U	2.20	U	5.80	U
1,3-Dichloropropane	4.10	U	3.40	U	4.30	U	4.4	U	1.70	U	1.70	U	7.80	U	4.10	U	1.80	U	0.81	U	1.4	U	1.70	U	4.50	U
1,4-Dichlorobenzene	5.40	U	4.40	U	5.60	U	5.8	U	2.20	U	2.20	U	10.00	U	5.40	U	2.40	U	1.10	U	1.8	U	2.20	U	5.80	U
1,4-Dioxane	6.4	U	5.3	U	6.7	U	6.9	U	2.7	U	2.7	U	12.0	U	6.4	U	2.8	U	1.3	U	2.2	U	2.7	U	7.0	U
2,2,4-Trimethylpentane	**5**	**D**	**5.1**	**D**	**3.5**	**D**	**5.8**	**D**	**4.0**	**D**	**250**	**D**	**5,100**	**D**	**8**	**D**	**4.2**	**D**	**4**	**D**	**3.4**	**D**	**4.3**	**D**	**4.1**	**D**
2-Butanone	**130**	**J**	**110**	**J**	**140**	**J**	**140**	**J**	**54**	**J**	**55.0**	**J**	**250**	**J**	**130**	**J**	**58**	**J**	**26**	**J**	**44**	**J**	**55**	**J**	**140**	**J**
2-Hexanone	7.3	U	6.0	U	7.7	U	7.9	U	**9.4**	**D**	**3.8**	**D**	14.0	U	7.3	U	3.2	U	**2.5**	**D**	**2.9**	**D**	**3.3**	**D**	7.9	U
3-Chloropropene	14.00	U	11.00	U	15.00	U	15.0	U	5.80	U	5.80	U	26.00	U	14.00	U	6.10	U	2.80	U	4.7	U	5.80	U	15.00	U
4-Methyl-2-pentanone	3.7	U	3.0	U	3.8	U	3.9	U	2	U	1.5	U	6.9	U	3.7	U	1.6	U	**5.8**	**D**	1.2	U	2	U	4.0	U
Acetone	**410**	**D**	**380**	**D**	**390**	**D**	**470**	**D**	**370**	**D**	**240**	**D**	**490**	**D**	**500**	**D**	**330**	**D**	**200**	**D**	**260**	**D**	**310**	**D**	**620**	**D**
Acrylonitrile	97.00	U	**79**	**J**	**100**	**J**	100.00	U	**40**	**J**	40.00	U	180.00	U	97.00	U	**43**	**J**	**19**	**J**	33.00	U	40.00	U	110.00	U
Benzene	2.90	U	**4.2**	**D**	3.00	U	3.1	U	**2.0**	**D**	1.20	U	5.40	U	2.80	U	**1.5**	**D**	**1.00**	**D**	**1.1**	**D**	**2.10**	**D**	**3.10**	**D**
Benzyl chloride	46.00	U	38.0	U	48.00	U	50.0	U	19.0	U	19.0	U	87.00	U	46.00	U	20.0	U	9.10	U	16.0	U	19.0	U	50.0	U
Bromodichloromethane	6.0	U	4.9	U	**7.5**	**D**	**7.1**	**D**	2.5	U	2.5	U	11.0	U	6.0	U	2.6	U	1.2	U	2.0	U	2.5	U	6.5	U
Bromoform	9.20	U	7.60	U	9.70	U	9.90	U	3.80	U	3.90	U	17.00	U	9.20	U	4.10	U	1.80	U	3.10	U	3.80	U	10.00	U
Bromomethane	3.5	U	2.80	U	3.60	U	3.70	U	1.40	U	1.40	U	6.5	U	3.5	U	1.50	U	0.68	U	1.20	U	1.40	U	3.80	U
Carbon disulfide	**9.7**	**D**	**13**	**D**	**4.7**	**D**	3.00	U	**14**	**D**	**1.2**	**D**	5.20	U	**5.0**	**D**	**7.5**	**D**	**4.4**	**D**	**8.4**	**D**	**11**	**D**	**22**	**D**
Carbon tetrachloride	1.40	U	1.20	U	1.50	U	1.5	U	0.58	U	0.59	U	2.60	U	1.40	U	0.62	U	**0.33**	**D**	0.5	U	0.58	U	1.50	U
Chlorobenzene	4.10	U	3.40	U	4.30	U	4.40	U	1.70	U	1.70	U	7.70	U	4.10	U	1.80	U	0.81	U	1.40	U	1.70	U	4.50	U
Chloroethane	2.40	U	1.9	U	2.50	U	3	U	0.97	U	0.98	U	4.40	U	2.40	U	1.0	U	0.46	U	1	U	0.98	U	2.60	U
Chloroform	4.40	U	3.60	U	**340**	**D**	**310**	**D**	**1.80**	**U**	1.80	U	8.20	U	**11**	**D**	**43**	**D**	**21**	**D**	1.5	U	1.8	U	4.70	U
Chloromethane	1.80	U	**3.3**	**D**	1.90	U	2.00	U	**1.1**	**D**	0.77	U	3.50	U	1.80	U	0.81	U	0.36	U	0.62	U	0.76	U	2.00	U
cis-1,2-Dichloroethylene	1.80	U	1.50	U	1.90	U	1.9	U	0.73	U	0.74	U	3.30	U	1.80	U	0.78	U	0.35	U	0.6	U	0.73	U	1.90	U
cis-1,3-Dichloropropylene	4.10	U	3.30	U	4.20	U	4.40	U	1.70	U	1.70	U	7.60	U	4.00	U	1.80	U	0.80	U	1.40	U	1.70	U	4.40	U
Cyclohexane	3.1	U	2.5	U	3.2	U	3.3	U	**2.9**	**D**	**5.0**	**D**	**110**	**D**	3.1	U	1.4	U	**0.7**	**D**	1.0	U	1.3	U	3.3	U
Dibromochloromethane	7.6	U	6.2	U	8.0	U	8.2	U	3.1	U	3.2	U	14.0	U	7.6	U	3.3	U	1.5	U	2.6	U	3.2	U	8.3	U
Dichlorodifluoromethane	4.4	U	3.6	U	4.6	U	4.8	U	1.8	U	1.8	U	8.3	U	4.4	U	1.9	U	0.9	U	1.5	U	**2.4**	**D**	4.8	U
Ethyl acetate	**160**	**J**	**130**	**J**	**170**	**J**	**170**	**J**	**67**	**J**	**67**	**J**	300	U	**160**	**J**	**71**	**J**	**32**	**J**	**54**	**J**	**67**	**J**	**170**	**J**
Ethyl Benzene	**4.7**	**D**	**3.8**	**D**	4.1	U	4.2	U	**3.2**	**D**	**2.9**	**D**	**180**	**D**	**3.9**	**D**	**4.1**	**D**	**4.0**	**D**	**2.7**	**D**	**3.4**	**D**	4.2	U
Hexachlorobutadiene	9.5	U	7.80	U	10.00	U	10.0	U	3.9	U	4.00	U	18.0	U	9.5	U	4.20	U	1.90	U	3.2	U	3.9	U	10.00	U
Isopropanol	**13**	**J**	**11**	**J**	**14**	**J**	**14**	**J**	**6.90**	**D**	**5.70**	**D**	**25**	**J**	**13**	**J**	**7.4**	**D**	**5**	**D**	**6.5**	**D**	**8**	**D**	**14**	**J**
Methyl Methacrylate	3.70	U	3.00	U	3.80	U	3.90	U	1.50	U	1.50	U	6.90	U	3.60	U	1.60	U	0.72	U	1.20	U	1.50	U	4.00	U
Methyl tert-butyl ether (MTBE)	3.2	U	2.6	U	3.4	U	3.5	U	1.3	U	1.3	U	6.1	U	3.2	U	1.4	U	0.6	U	1.1	U	1.3	U	3.5	U
Methylene chloride	19.00	U	15.00	U	19.00	U	20.0	U	7.70	U	7.80	U	35.00	U	19.00	U	8.20	U	3.70	U	6.3	U	7.70	U	20.00	U
Naphthalene	47.00	U	38.00	U	49.00	U	50.00	U	19.00	U	20.00	U	88.00	U	47.00	U	21.00	U	9.20	U	16.00	U	19.00	U	51.00	U
n-Heptane	3.7	U	3.0	U	3.8	U	3.9	U	**3.3**	**D**	**12**	**D**	**620**	**D**	3.7	U	**2.4**	**D**	**1.9**	**D**	**2.0**	**D**	**2.6**	**D**	4.00	U
n-Hexane	3	U	2.6	U	3.3	U	3.4	U	**3.0**	**D**	**5.0**	**D**	**81**	**D**	3	U	**1.5**	**D**	**1.2**	**D**	**2.3**	**D**	**3.3**	**D**	3.4	U
o-Xylene	**13.0**	**D**	**7.3**	**D**	**6.9**	**D**	**6.3**	**D**	**6.6**	**D**	**6.8**	**D**	**1,200**	**D**	**7.7**	**D**	**7.3**	**D**	**8.3**	**D**	**5.1**	**D**	**5.8**	**D**	**4.2**	**D**
p- & m- Xylenes	**20**	**D**	**14**	**D**	**12**	**D**	**11**	**D**	**12**	**D**	**13**	**D**	**2,400**	**D**	**16**	**D**	**15**	**D**	**16**	**D**	**10**	**D**	**12**	**D**	**9**	**D**
p-Ethyltoluene	4.4	U	3.60	U	4.60	U	4.7	U	1.80	U	1.80	U	8.3	U	4.4	U	1.90	U	0.87	U	1.5	U	1.80	U	4.80	U
Propylene	1.5	U	**5.9**	**D**	**6**	**D**	2	U	**8**	**D**	**3.7**	**D**	**5.5**	**D**	1.5	U	**5.8**	**D**	**24**	**D**	**4**	**D**	1	U	**280.0**	**D**
Styrene	4	U	3	U	4.0	U	4.1	U	1.60	U	1.60	U	**36**	**D**	4	U	2	U	**0.9**	**D**	1.3	U	1.60	U	4.10	U
Tetrachloroethylene	**110**	**D**	**89**	**D**	**880**	**D**	**300**	**D**	**9.3**	**D**	**4.8**	**D**	11.0	U	**120**	**D**	**150**	**D**	**350**	**D**	**41**	**D**	**43**	**D**	**28**	**D**
Tetrahydrofuran	5.30	U	4.30	U	5.50	U	5.7	U	2.20	U	2.20	U	9.90	U	5.30	U	2.30	U	1.00	U	1.8	U	2.20	U	5.70	U
Toluene	**21**	**D**	**16**	**D**	**9.5**	**D**	**13**	**D**	**13**	**D**	**8.40**	**D**	**18**	**D**	**13**	**D**	**15**	**D**	**12**	**D**	**11**	**D**	**15**	**D**	**12**	**D**
trans-1,2-Dichloroethylene	3.50	U	2.90	U	3.70	U	3.80	U	1.50	U	1.50	U	6.70	U	3.50	U	1.60	U	0.70	U	1.20	U	1.50	U	3.80	U
trans-1,3-Dichloropropylene	4.1	U	3.3	U	4.2	U	4.4	U	1.7	U	1.7	U	7.6	U	4.0	U	1.8	U	0.8	U	1.4	U	1.7	U	4.4	U
Trichloroethylene	1.20	U	0.98	U	1.30	U	**3.1**	**D**	0.50	U	0.50	U	2.30	U	1.20	U	**2.3**	**D**	0.24	U	0.40	U	0.50	U	1.30	U
Trichlorofluoromethane (Freon 11)	5.00	U	4.10	U	5.30	U	5.4	U	2.10	U	2.10	U	9.40	U	5.00	U	2.20	U	**1.30**	**D**	1.7	U	2.10	U	5.40	U
Vinyl acetate	3.10	U	2.60	U	3.30	U	3.40	U	1.30	U	1.30	U	5.90	U	3.10	U	1.40	U	0.62	U	1.10	U	1.30	U	3.40	U
Vinyl bromide	3.9	U	3.2	U	4.1	U	4.2	U	1.6	U	1.6	U	7.3	U	3.9	U	1.7	U	0.8	U	1.3	U	1.6	U	4.2	U
Vinyl Chloride	1.1	U	0.9	U	1.2	U	1.2	U	0.5	U	0.5	U	2.1	U	1.1	U	0.5	U	0.2	U	0.4	U	0.5	U	1.2	U

NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
D=result is from an analysis that required a dilution
NT=this indicates the analyte was not a target for this sample
Bolded indicates concentration is greater than MDL

FIGURES



3083 WEBSTER AVE BCP SITE:
3083 WEBSTER AVENUE, BRONX, NY

N

0 600

APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

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231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

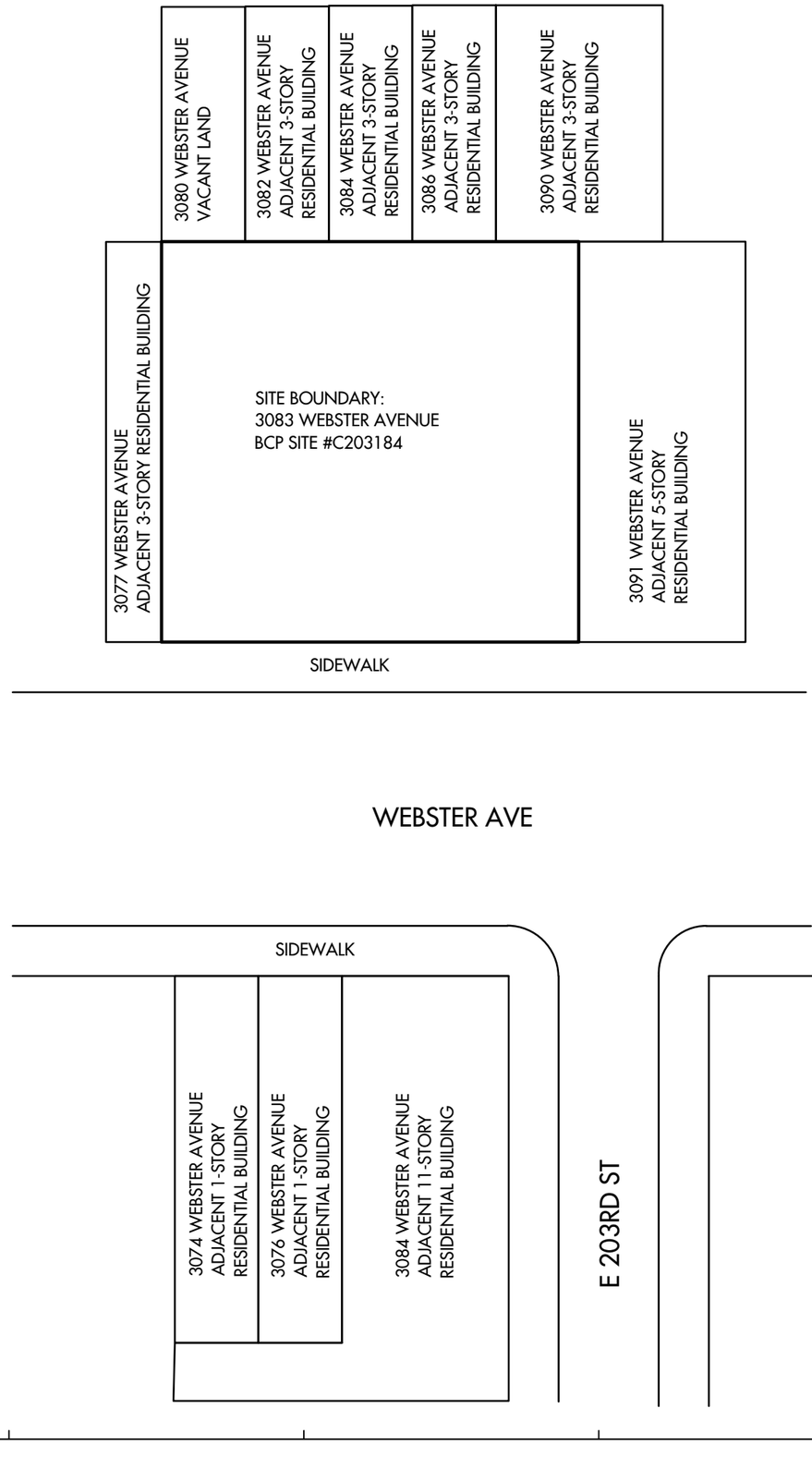
PROJECT NAME AND ADDRESS

3083 WEBSTER AVENUE, BRONX, NY

PROJECT FIGURE

FIGURE 1- SITE LOCATION MAP

PROJECT NO.	DATE
250033	08/28/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



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BASE DRAWING PREPARED BY

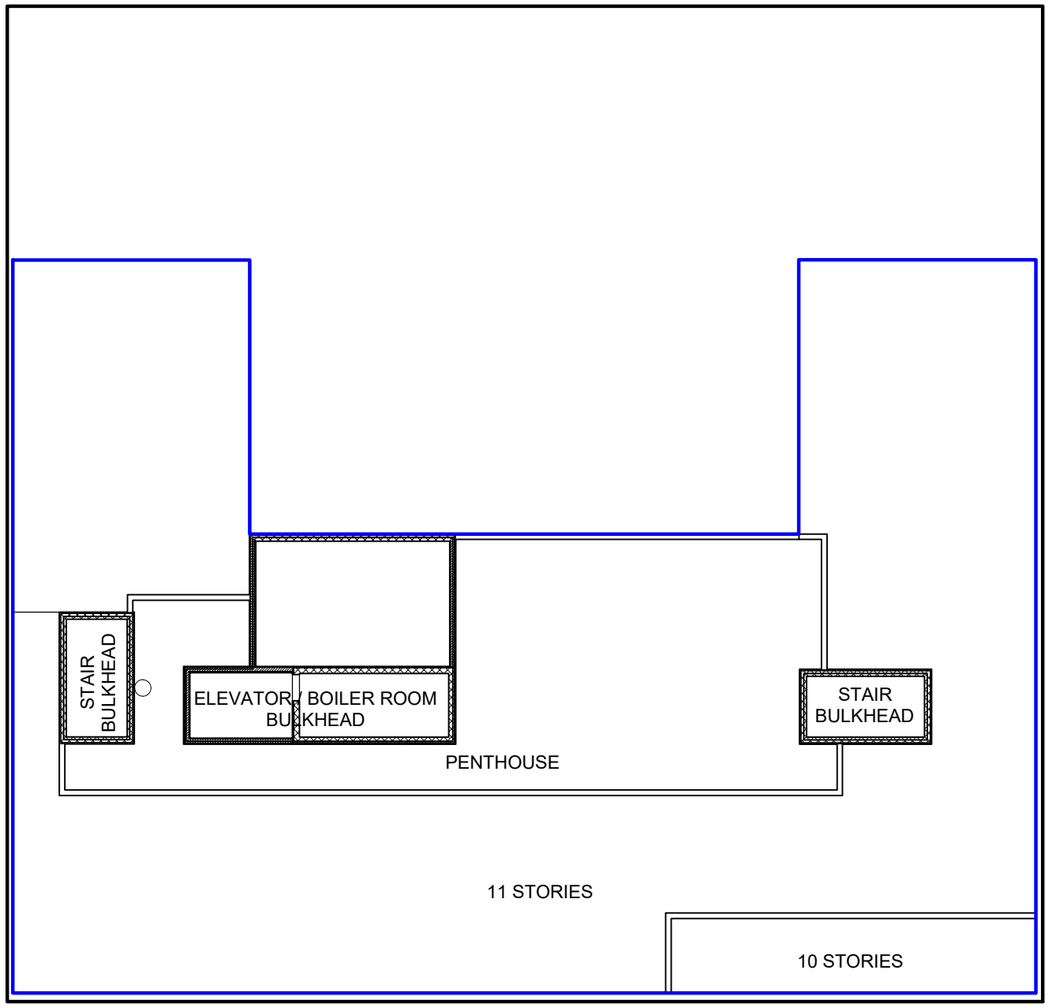
PROJECT NAME AND ADDRESS

3083 WEBSTER AVENUE, BRONX, NY

PROJECT FIGURE

FIGURE 2- SITE BOUNDARY MAP

PROJECT NO.	DATE
250033	08/28/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



WEBSTER AVENUE

LEGEND:

PROPERTY BOUNDARY

BUILDING OUTLINE

0 30

APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

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BASE DRAWING PREPARED BY:

BECALL ENGINEERING SERVICES-ZONING COMPLIANCE NOTES AND SCHEDULES

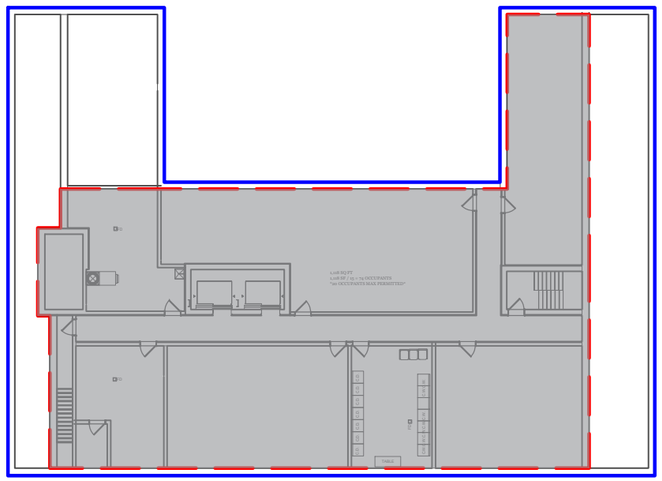
PROJECT NAME AND ADDRESS

3083 WEBSTER AVENUE, BRONX, NY.

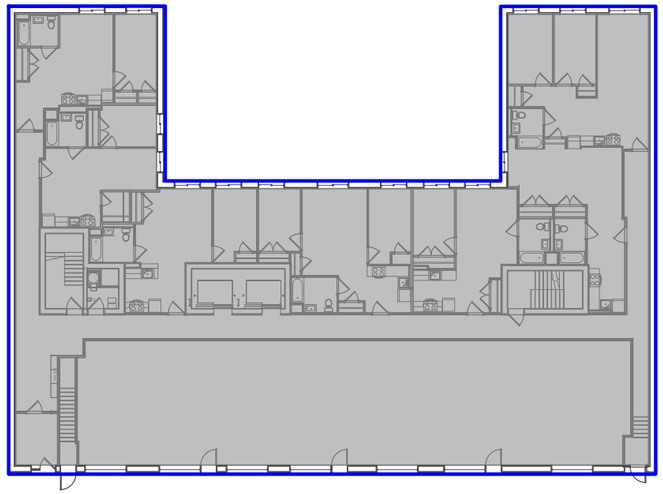
PROJECT FIGURE

FIGURE 3A: PROPOSED REDEVELOPMENT PLAN

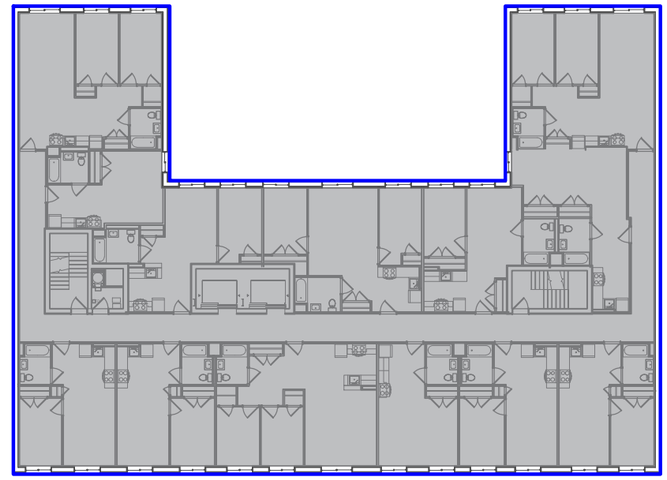
PROJECT NO.	DATE
240040	03/30/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



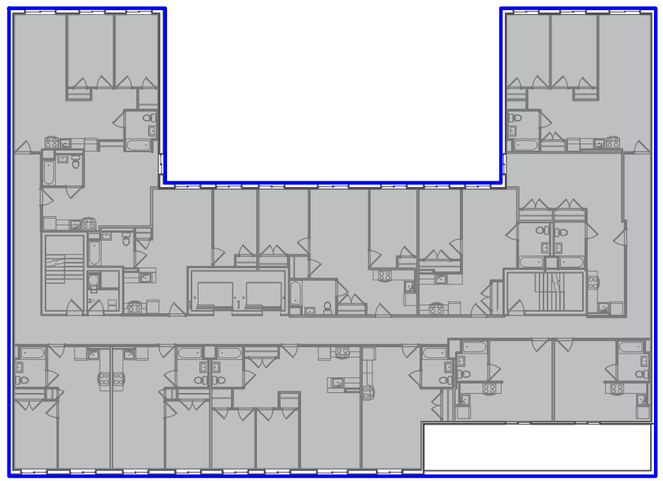
PARTIAL BASEMENT



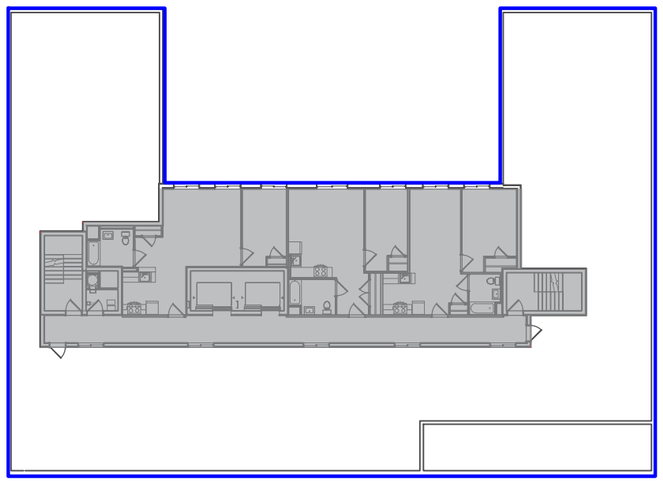
FIRST FLOOR



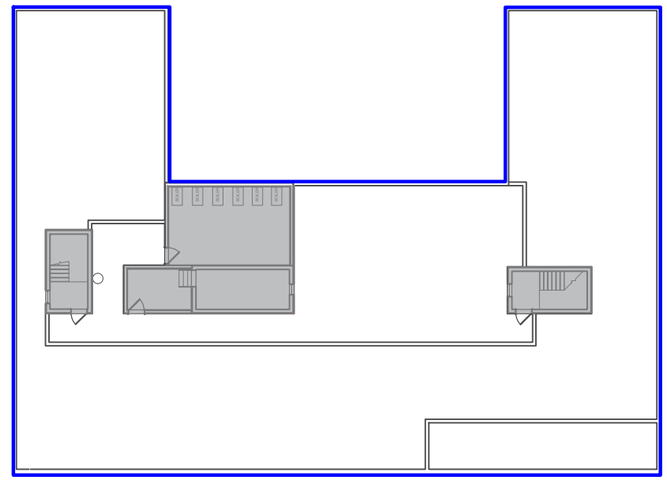
SECOND - TENTH FLOOR



ELEVENTH FLOOR



PENTHOUSE FLOOR



BULKHEAD

LEGEND:

PARTIAL BASEMENT LAYOUT

BUILDING OUTLINE

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BASE DRAWING PREPARED BY:

BECALL ENGINEERING SERVICES- ZONING COMPLIANCE NOTES

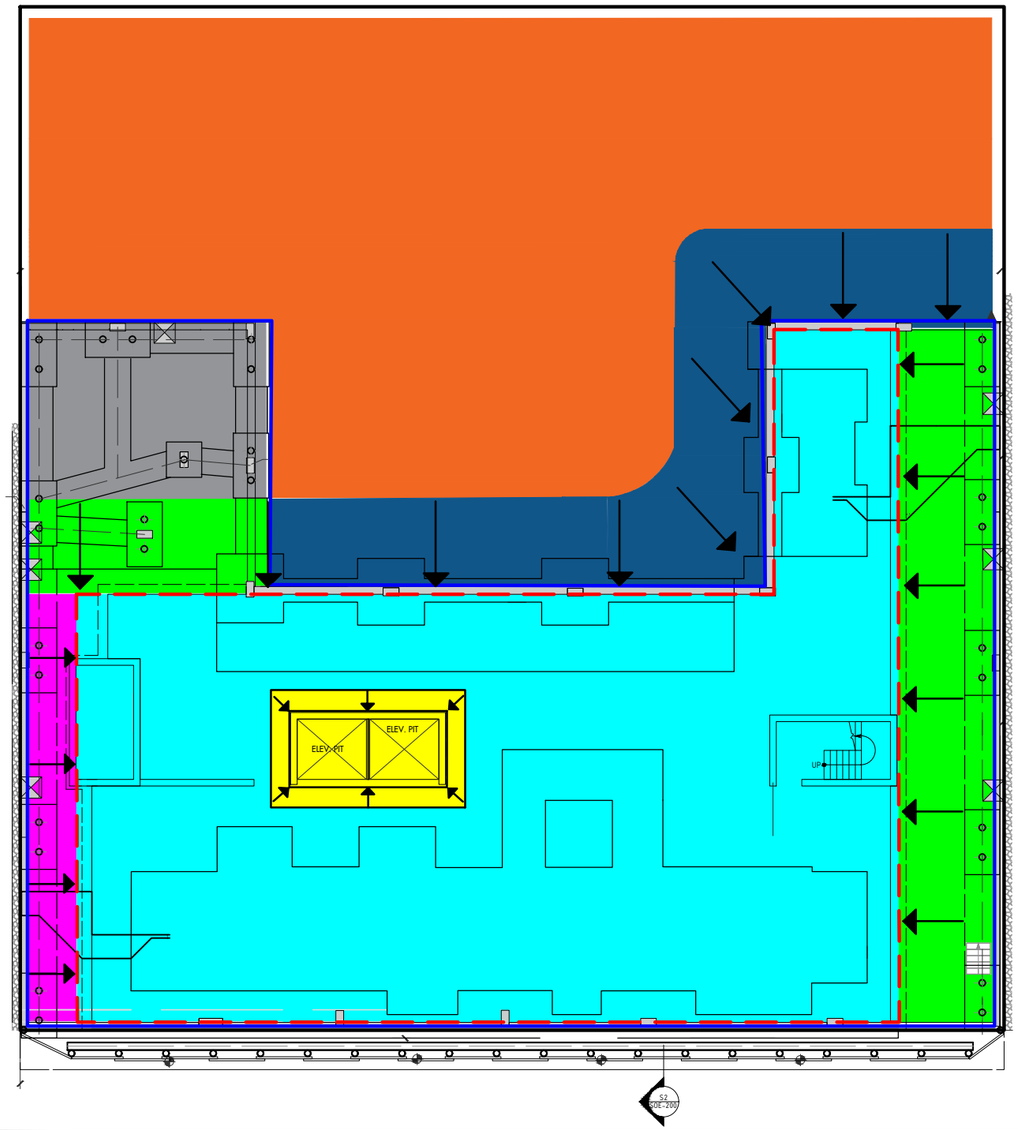
PROJECT NAME AND ADDRESS

3083 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 3B: PROPOSED REDEVELOPMENT PLAN

PROJECT NO.	DATE
240040	03/30/26
DRAWN BY	REVIEWED BY
A.S.	P.M.
SCALE (11X17)	APPROVED BY
AS SHOWN	P.M.



WEBSTER AVENUE

LEGEND:

- PROPERTY BOUNDARY
- BUILDING OUTLINE
- PARTIAL BASEMENT LAYOUT
- EXCAVATION TO 7FT BGS SLOPED DOWN TO PARTIAL BASEMENT AT 45° ANGLE
- EXCAVATION TO 10FT BGS SLOPED DOWN TO PARTIAL BASEMENT AT 45° ANGLE
- EXCAVATION TO 2FT BGS SLOPED DOWN TO PARTIAL BASEMENT AT 45° ANGLE
- EXCAVATION TO 2 FEET BGS FOR OPEN AREA
- EXCAVATION TO 23 FT BGS FOR ELEVATOR PIT SLOPED DOWN AT 45° FROM 16 FT BGS
- EXCAVATION TO 13-16 FEET BGS FOR FOOTING FOUNDATIONS AND SLAB OF PARTIAL BASEMENT
- EXCAVATION TO 7 FT BGS FOR ON-GRADE FOOTINGS

NOTE:

1. BGS = BELOW SIDEWALK GRADE
2. RRSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES - RESTRICTED RESIDENTIAL
3. PGWSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES- PROTECTION OF GROUNDWATER

0 30
APPROXIMATE SCALE IN FEET

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TEL: (631) 462-5866

BASE DRAWING PREPARED BY

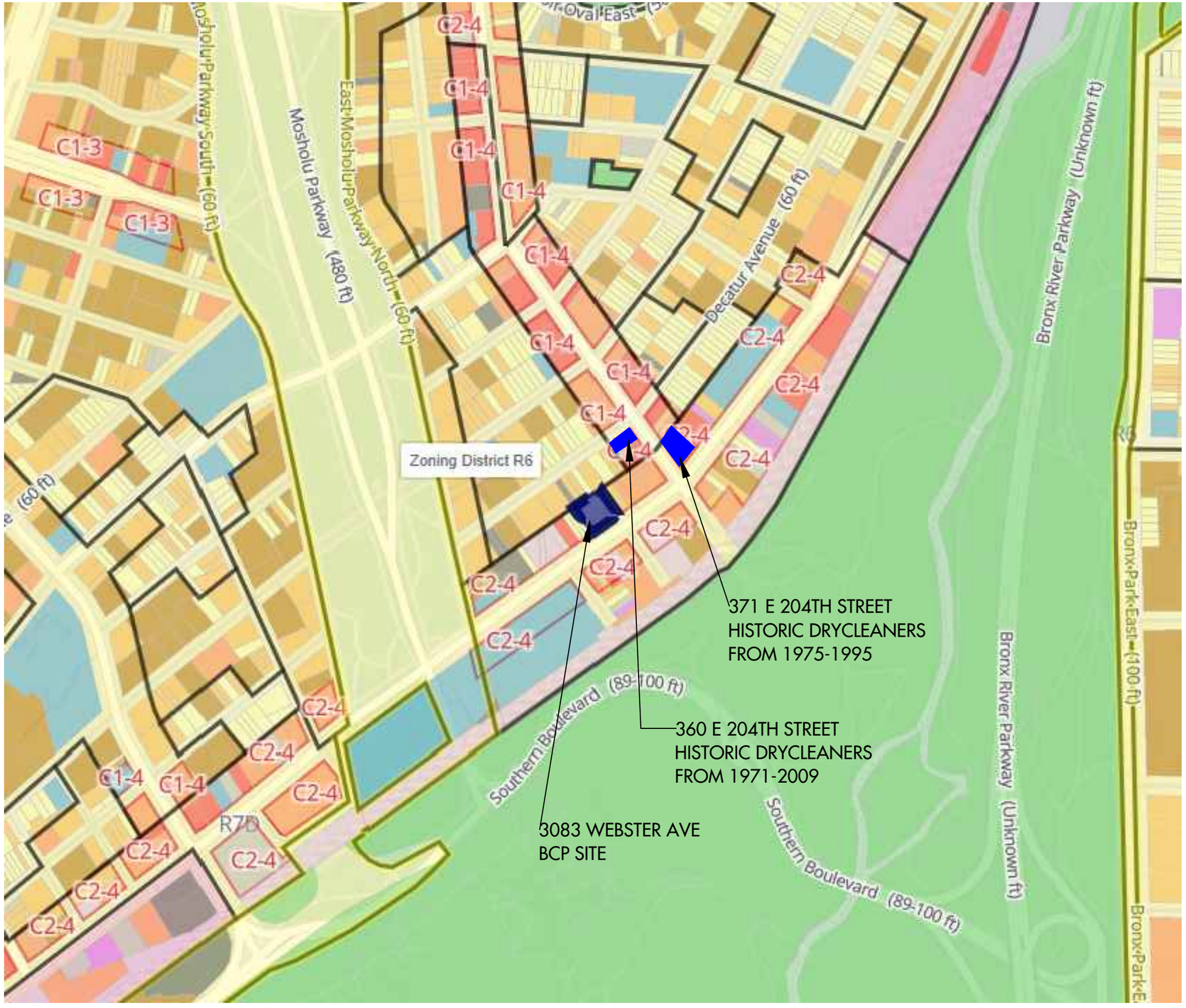
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 4: MAP OF EXCAVATION FOR CONSTRUCTION

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



N

Zoning and Land Use

Tax Lots

- One & Two Family Buildings
- Multi-Family Walk-Up Buildings
- Multi-Family Elevator Buildings
- Mixed Residential & Commercial Buildings
- Commercial & Office Buildings
- Industrial & Manufacturing
- Transportation & Utility
- Public Facilities & Institutions
- Open Space & Outdoor Recreation
- Parking Facilities
- Vacant Land
- Other

Zoning Districts

- Commercial Districts
- Manufacturing Districts
- Residence Districts
- Parks
- Battery Park City

Commercial Overlays

- C1-1 through C1-5
- C2-1 through C2-5

Basemaps

- Subways
- Building Footprints

- Historic Drycleaners

0 500

APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HydroTech

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TEL: (631) 462-5866

BASE DRAWING PREPARED BY

GOOGLE EARTH

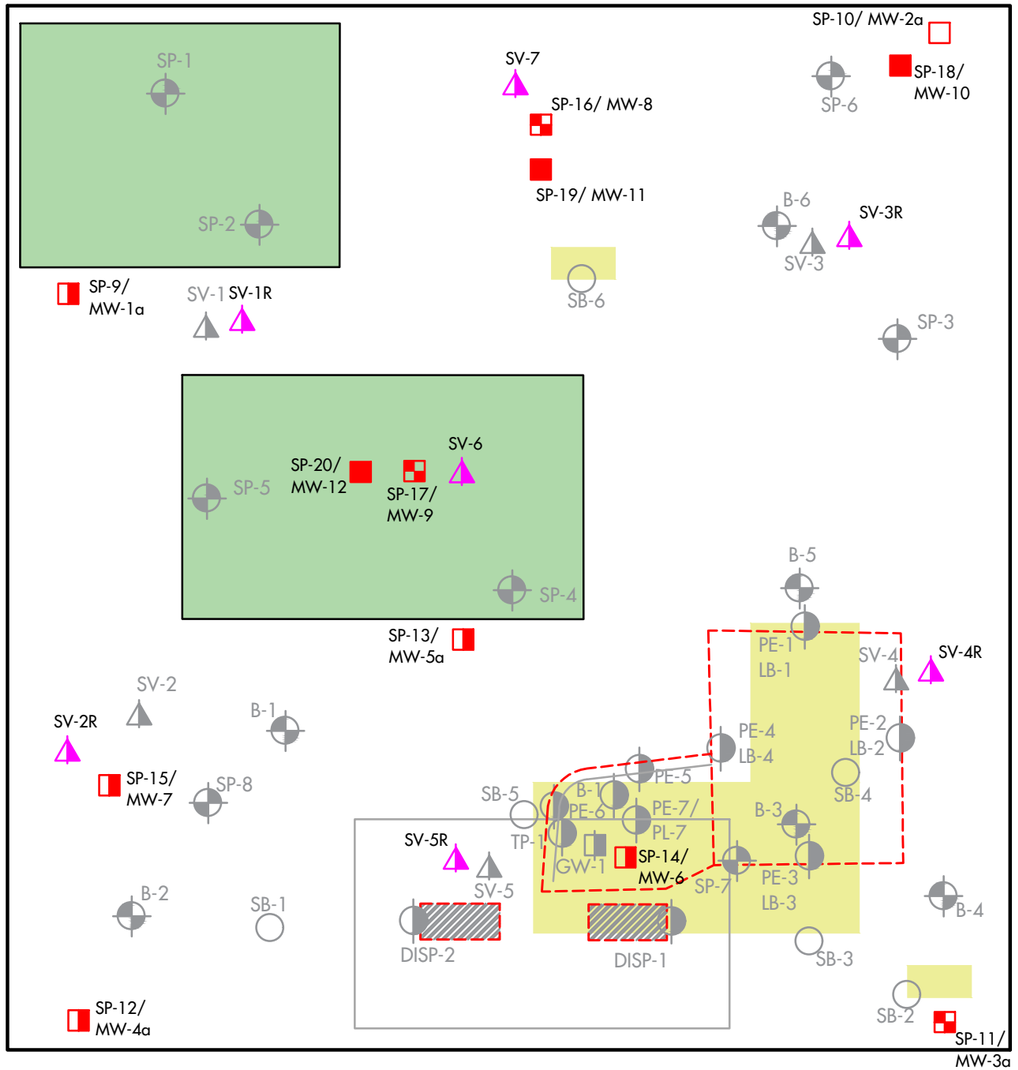
PROJECT NAME AND ADDRESS

3083 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 5: SURROUNDING LAND USE MAP

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



WEBSTER AVENUE

LEGEND:

- SITE BOUNDARY
- EXTENT OF FORMER SOIL EXCAVATION AROUND REMOVED USTs BY TYREE IN JANUARY 1998
- EXTENT OF FORMER SOIL EXCAVATION AROUND REMOVED USTs AND DISPENSERS BY LABELLA IN AUGUST 2021
- FORMER LOCATIONS OF REMOVED DISPENSERS
- FORMER LOCATION OF REMOVED PRODUCT LINE
- CANOPY OF FORMER DISPENSERS
- 1-STORY FORMER AUTO REPAIR BUILDINGS
- RI SOIL PROBES (SP-)/MONITORING WELL (MW-) SCREENED IN OVERBURDEN MATERIAL/WEATHERED BEDROCK (WR)-INSTALLED BY HYDROTECH IN JULY 2025
- RI SOIL PROBES (SP-)/MONITORING WELL (MW-) SCREENED IN WEATHERED BEDROCK/COMPETENT BEDROCK (WR/BR) - INSTALLED BY HYDROTECH IN JULY 2025
- RI SOIL PROBES (SP-)/BEDROCK MONITORING WELL (MW-) SCREENED IN BEDROCK (BR) - INSTALLED BY HYDROTECH IN JULY 2025
- RI SOIL PROBES (SP-)/BEDROCK MONITORING WELL (MW-) SCREENED IN BEDROCK (BR)- INSTALLED BY HYDROTECH IN DECEMBER 2025
- RI SOIL VAPOR PROBE (SV-)
- GROUNDWATER GRAB SAMPLE (GW-) FROM TEST PIT COLLECTED IN SEPTEMBER 2021
- SOIL VAPOR PROBE (SV-) INSTALLED BY HYDROTECH IN JULY 2025
- SOIL PROBE (SP-) INSTALLED BY HYDROTECH IN JULY 2025
- SOIL PROBES (B-) INSTALLED BY ADVANTAGE ENVIRONMENTAL CONSULTANTS, LLC IN DECEMBER 2021
- POST-USTs, DISPENSERS, TEST PIT AND PRODUCT LINE EXCAVATION ENDPOINT SAMPLES (PE-, LB-, PL-, TP-, DISP-) COLLECTED BY LABELLA ASSOCIATES, D.P.C. (LABELLA) IN AUGUST & SEPTEMBER 2021
- SOIL PROBE/GROUNDWATER PROBE INSTALLED BY TYREE BROTHER'S ENVIRONMENTAL SERVICES, INC (TYREE) IN OCTOBER 2009

ASTs = ABOVEGROUND STORAGE TANK
UST = UNDERGROUND STORAGE TANK
RI = REMEDIAL INVESTIGATION

0' 40'
APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

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BASE DRAWING PREPARED BY

PROJECT NAME AND ADDRESS

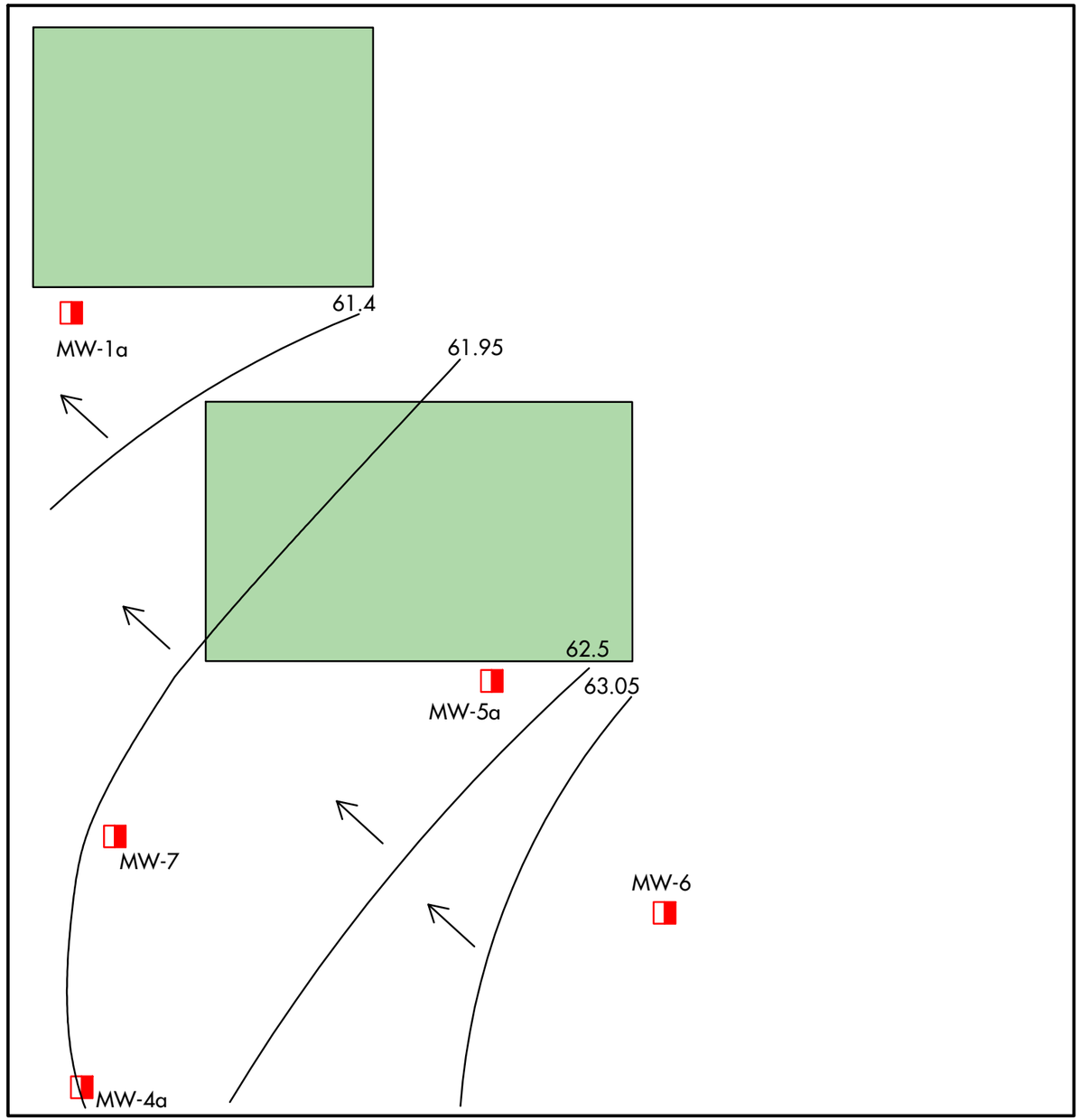
3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 6: SAMPLING LOCATION MAP

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

CI	0.55 ft	Screen Interval
Monitoring Well ID	Groundwater Elevation (ft)	
MW-1a	59.66	WR
MW-4a	61.51	WR
MW-5a	62.37	WR
MW-6	64.86	WR
MW-7	61.59	WR



LEGEND:

- SITE BOUNDARY
- 1-STORY FORMER AUTO REPAIR BUILDINGS
- RI MONITORING WELL (MW-) SCREENED IN OVERBURDEN MATERIAL/WEATHERED BEDROCK (WR)-INSTALLED BY HYDROTECH IN JULY 2025
- GROUNDWATER FLOW DIRECTION
- GROUNDWATER CONTOUR LINE
- CI = CONTOUR INTERVAL

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SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

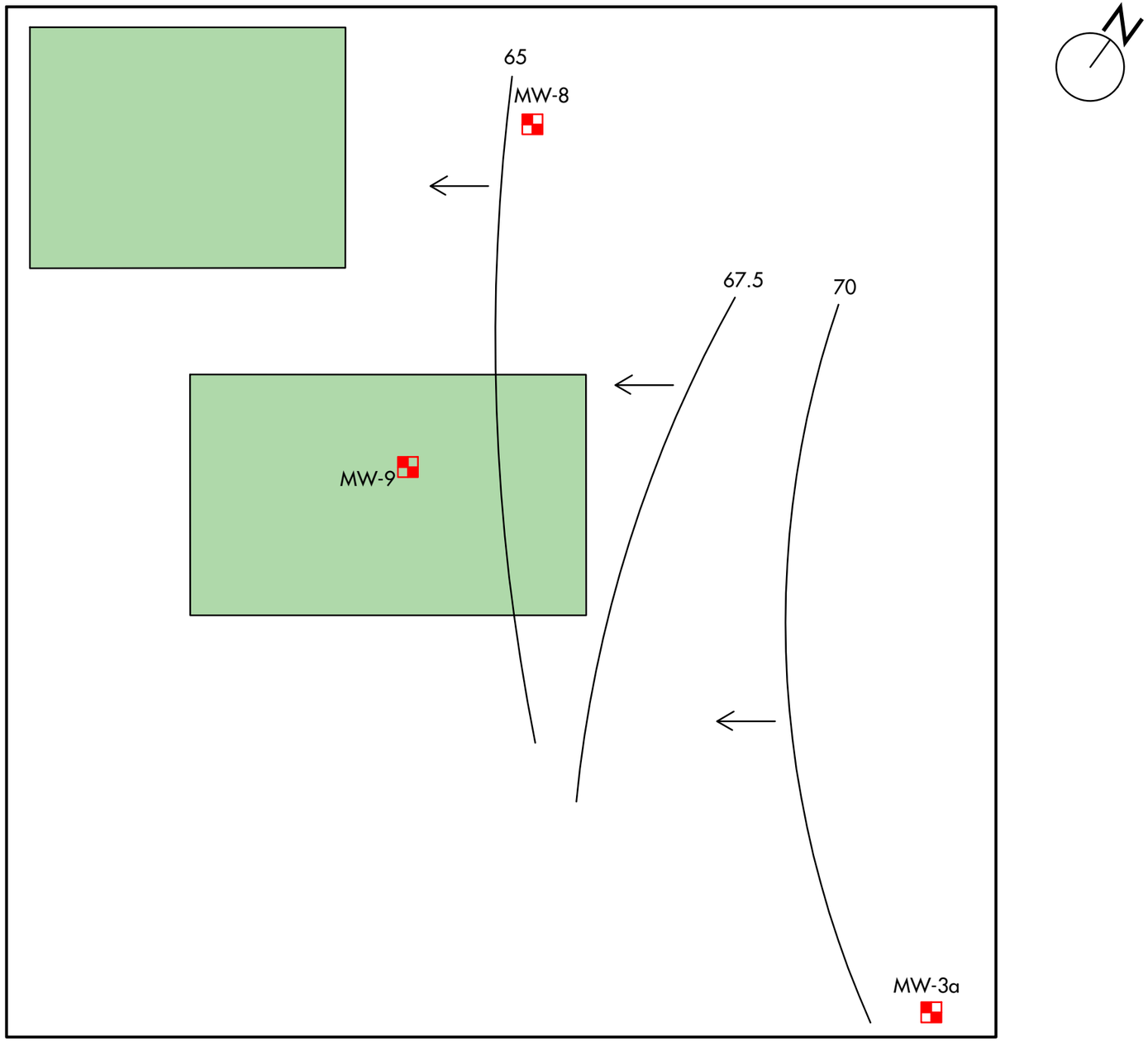
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE
FIGURE 7A: GROUNDWATER FLOW CONTOURS - OVERBURDEN MATERIAL/WEATHERED BEDROCK- AUGUST 2025

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

CI	2.5 ft	Screen Interval
Monitoring Well ID	Groundwater Elevation (ft)	
MW-3a	72.38	WR/BR
MW-8	65.17	WR/BR
MW-9	63.53	WR/BR



LEGEND:

- SITE BOUNDARY
- 1-STORY FORMER AUTO REPAIR BUILDINGS
- RI MONITORING WELL (MW-) SCREENED IN WEATHERED BEDROCK/COMPETENT BEDROCK (WR/BR)- INSTALLED BY HYDROTECH IN JULY 2025
- GROUNDWATER FLOW DIRECTION
- GROUNDWATER CONTOUR LINE
- CI = CONTOUR INTERVAL

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231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

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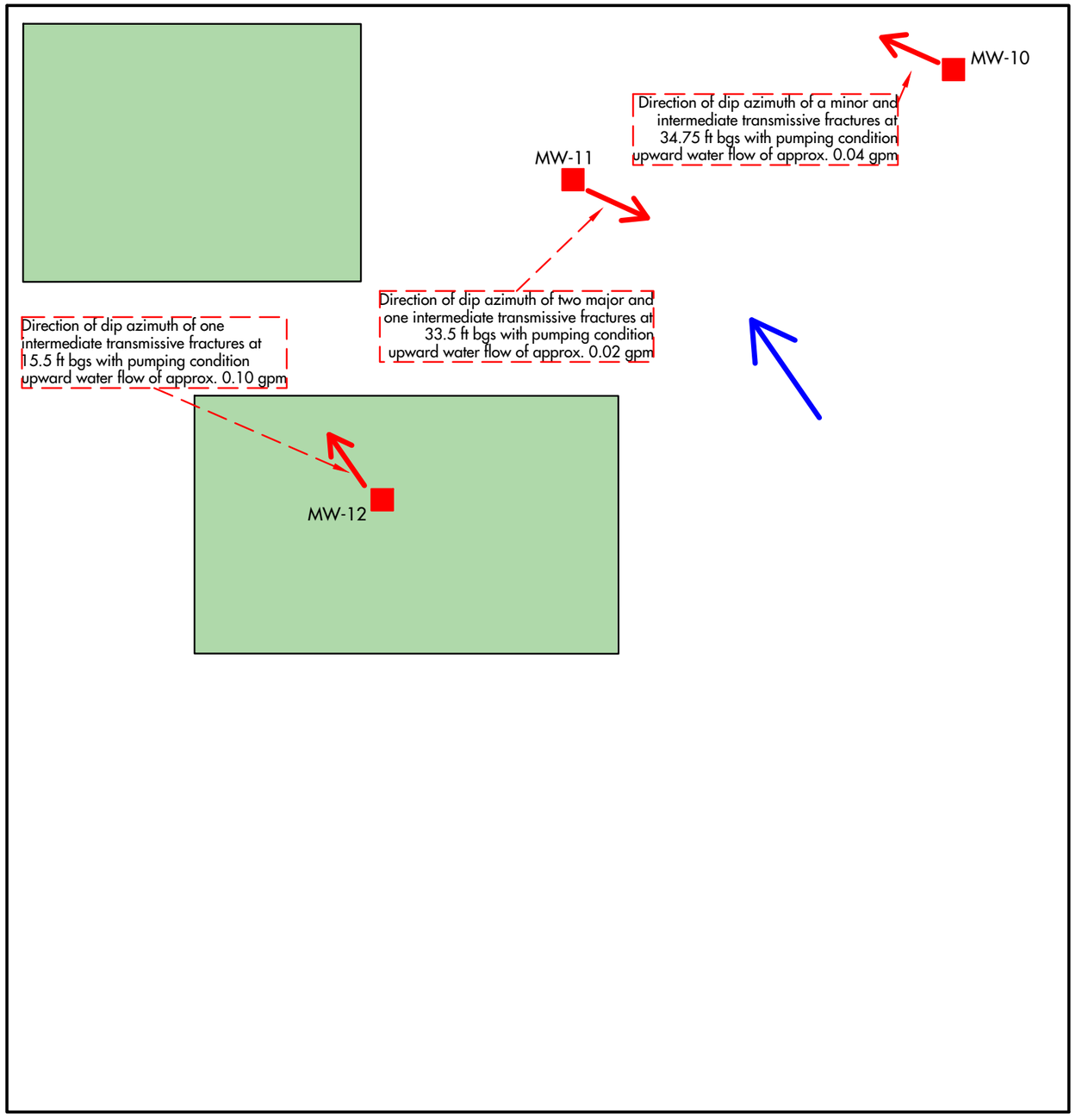
BASE DRAWING PREPARED BY

PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE
FIGURE 7B: GROUNDWATER FLOW CONTOURS - WEATHERED BEDROCK/COMPETENT BEDROCK- AUGUST 2025

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



LEGEND:

- SITE BOUNDARY
- 1-STORY FORMER AUTO REPAIR BUILDINGS
- RI BEDROCK MONITORING WELL (MW-) SCREENED IN BEDROCK (BR)-INSTALLED BY HYDROTECH IN DECEMBER 2025 AND WERE SUBJECT TO BOREHOLE GEOPHYSICAL LOGGING
- DIP AZIMUTH ANGLE ORIENTATION FROM HORIZONTAL OF A BEDROCK FRACTURE
- INFERRED GROUNDWATER FLOW DIRECTION FROM THE HIGH FREQUENCY OF NORTHWEST DIPPING TRANSMISSIVE BEDROCK FRACTURES WITH REMARKABLE WATER FLOW RATES UNDER PUMPING CONDITIONS

BGS = BELOW GRADE SURFACE

NOTE:
TRANSMISSIVE FRACTURES DIP AZIMUTH, FRACTURE CATEGORIES, AND FRACTURE DEPTHS ARE PROVIDED FOR MW-10, MW-11 AND MW-12 IN A BOREHOLE GEOPHYSICAL LOGGING REPORT BY HAGER-RICHTER GEOSCIENCE, INC. DATED JANUARY 2026

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DATE	DESCRIPTION	CHK

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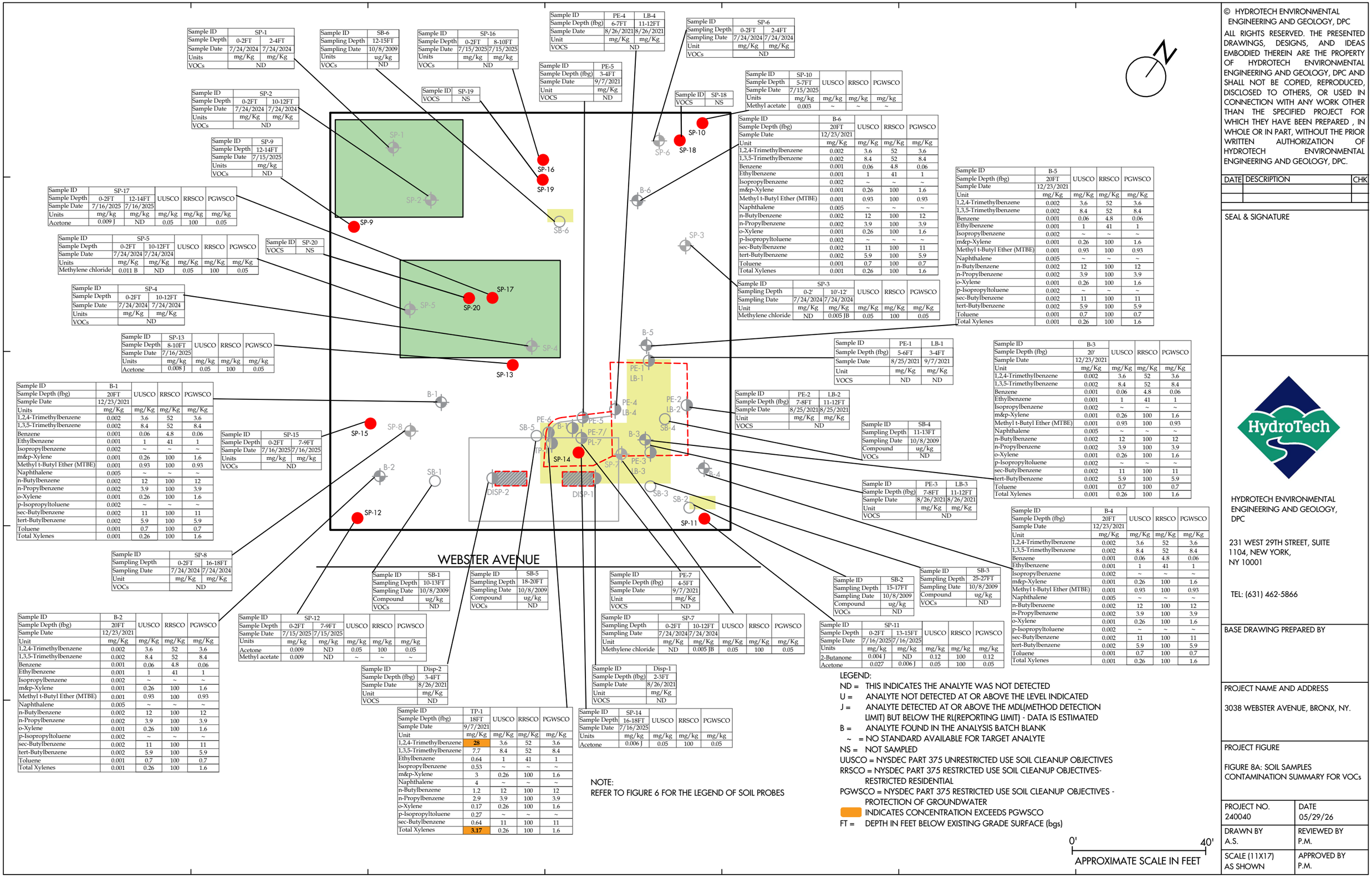
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 7C: GROUNDWATER FLOW CONTOURS - COMPETENT BEDROCK- JANUARY 2026

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



Sample ID	SP-1	
Sample Depth	0-2FT	2-4FT
Sample Date	7/24/2024	7/24/2024
Units	mg/Kg	mg/Kg
VOCs	ND	

Sample ID	SB-6
Sampling Depth	12-15FT
Sampling Date	10/8/2009
Units	ug/kg
VOCs	ND

Sample ID	SP-16	
Sample Depth	0-2FT	8-10FT
Sample Date	7/15/2025	7/15/2025
Units	mg/kg	mg/kg
VOCs	ND	

Sample ID	PE-4	LB-4
Sample Depth (fbg)	6-7FT	11-12FT
Sample Date	8/26/2021	8/26/2021
Unit	mg/Kg	mg/Kg
VOCS	ND	

Sample ID	SP-6	
Sampling Depth	0-2FT	2-4FT
Sampling Date	7/24/2024	7/24/2024
Unit	mg/Kg	mg/Kg
VOCs	ND	

Sample ID	PE-5
Sample Depth (fbg)	3-4FT
Sample Date	9/7/2021
Unit	mg/Kg
VOCS	ND

Sample ID	SP-19
VOCS	NS

Sample ID	SP-18
VOCS	NS

Sample ID	SP-2	
Sample Depth	0-2FT	10-12FT
Sample Date	7/24/2024	7/24/2024
Units	mg/Kg	mg/Kg
VOCs	ND	

Sample ID	SP-9
Sample Depth	12-14FT
Sample Date	7/15/2025
Units	mg/kg
VOCs	ND

Sample ID	SP-10			
Sample Depth	5-7FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/15/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg
Methyl acetate	0.003	~	~	~

Sample ID	SP-17				
Sample Depth	0-2FT	12-14FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/16/2025	7/16/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Acetone	0.009 J	ND	0.05	100	0.05

Sample ID	B-6			
Sample Depth (fbg)	20FT	UUSCO	RRSCO	PGWSCO
Sample Date	12/23/2021			
Unit	mg/Kg	mg/Kg	mg/Kg	mg/Kg
1,2,4-Trimethylbenzene	0.002	3.6	52	3.6
1,3,5-Trimethylbenzene	0.002	8.4	52	8.4
Benzene	0.001	0.06	4.8	0.06
Ethylbenzene	0.001	1	41	1
Isopropylbenzene	0.002	~	~	~
m&p-Xylene	0.001	0.26	100	1.6
Methyl t-Butyl Ether (MTBE)	0.001	0.93	100	0.93
Naphthalene	0.005	~	~	~
n-Butylbenzene	0.002	12	100	12
n-Propylbenzene	0.002	3.9	100	3.9
o-Xylene	0.001	0.26	100	1.6
p-Isopropyltoluene	0.002	~	~	~
sec-Butylbenzene	0.002	11	100	11
tert-Butylbenzene	0.002	5.9	100	5.9
Toluene	0.001	0.7	100	0.7
Total Xylenes	0.001	0.26	100	1.6

Sample ID	B-5			
Sample Depth (fbg)	20FT	UUSCO	RRSCO	PGWSCO
Sample Date	12/23/2021			
Unit	mg/Kg	mg/Kg	mg/Kg	mg/Kg
1,2,4-Trimethylbenzene	0.002	3.6	52	3.6
1,3,5-Trimethylbenzene	0.002	8.4	52	8.4
Benzene	0.001	0.06	4.8	0.06
Ethylbenzene	0.001	1	41	1
Isopropylbenzene	0.002	~	~	~
m&p-Xylene	0.001	0.26	100	1.6
Methyl t-Butyl Ether (MTBE)	0.001	0.93	100	0.93
Naphthalene	0.005	~	~	~
n-Butylbenzene	0.002	12	100	12
n-Propylbenzene	0.002	3.9	100	3.9
o-Xylene	0.001	0.26	100	1.6
p-Isopropyltoluene	0.002	~	~	~
sec-Butylbenzene	0.002	11	100	11
tert-Butylbenzene	0.002	5.9	100	5.9
Toluene	0.001	0.7	100	0.7
Total Xylenes	0.001	0.26	100	1.6

Sample ID	SP-5				
Sample Depth	0-2FT	10-12FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Methylene chloride	0.011 B	ND	0.05	100	0.05

Sample ID	SP-20
VOCS	NS

Sample ID	SP-3				
Sampling Depth	0-2'	10'-12'	UUSCO	RRSCO	PGWSCO
Sampling Date	7/24/2024	7/24/2024			
Unit	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Methylene chloride	ND	0.005 JB	0.05	100	0.05

Sample ID	SP-4	
Sample Depth	0-2FT	10-12FT
Sample Date	7/24/2024	7/24/2024
Units	mg/Kg	mg/Kg
VOCs	ND	

Sample ID	SP-13				
Sample Depth	8-10FT	UUSCO	RRSCO	PGWSCO	
Sample Date	7/16/2025				
Units	mg/kg	mg/kg	mg/kg	mg/kg	
Acetone	0.008 J	0.05	100	0.05	

Sample ID	PE-1	LB-1
Sample Depth (fbg)	5-6FT	3-4FT
Sample Date	8/25/2021	9/7/2021
Unit	mg/Kg	mg/Kg
VOCS	ND	ND

Sample ID	B-3			
Sample Depth (fbg)	20'	UUSCO	RRSCO	PGWSCO
Sample Date	12/23/2021			
Unit	mg/Kg	mg/Kg	mg/Kg	mg/Kg
1,2,4-Trimethylbenzene	0.002	3.6	52	3.6
1,3,5-Trimethylbenzene	0.002	8.4	52	8.4
Benzene	0.001	0.06	4.8	0.06
Ethylbenzene	0.001	1	41	1
Isopropylbenzene	0.002	~	~	~
m&p-Xylene	0.001	0.26	100	1.6
Methyl t-Butyl Ether (MTBE)	0.001	0.93	100	0.93
Naphthalene	0.005	~	~	~
n-Butylbenzene	0.002	12	100	12
n-Propylbenzene	0.002	3.9	100	3.9
o-Xylene	0.001	0.26	100	1.6
p-Isopropyltoluene	0.002	~	~	~
sec-Butylbenzene	0.002	11	100	11
tert-Butylbenzene	0.002	5.9	100	5.9
Toluene	0.001	0.7	100	0.7
Total Xylenes	0.001	0.26	100	1.6

Sample ID	B-1			
Sample Depth (fbg)	20FT	UUSCO	RRSCO	PGWSCO
Sample Date	12/23/2021			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg
1,2,4-Trimethylbenzene	0.002	3.6	52	3.6
1,3,5-Trimethylbenzene	0.002	8.4	52	8.4
Benzene	0.001	0.06	4.8	0.06
Ethylbenzene	0.001	1	41	1
Isopropylbenzene	0.002	~	~	~
m&p-Xylene	0.001	0.26	100	1.6
Methyl t-Butyl Ether (MTBE)	0.001	0.93	100	0.93
Naphthalene	0.005	~	~	~
n-Butylbenzene	0.002	12	100	12
n-Propylbenzene	0.002	3.9	100	3.9
o-Xylene	0.001	0.26	100	1.6
p-Isopropyltoluene	0.002	~	~	~
sec-Butylbenzene	0.002	11	100	11
tert-Butylbenzene	0.002	5.9	100	5.9
Toluene	0.001	0.7	100	0.7
Total Xylenes	0.001	0.26	100	1.6

Sample ID	PE-2	LB-2
Sample Depth (fbg)	7-8FT	11-12FT
Sample Date	8/25/2021	8/25/2021
Unit	mg/Kg	mg/Kg
VOCS	ND	

Sample ID	SB-4
Sampling Depth	11-13FT
Sampling Date	10/8/2009
Compound	ug/kg
VOCs	ND

Sample ID	PE-3	LB-3
Sample Depth (fbg)	7-8FT	11-12FT
Sample Date	8/26/2021	8/26/2021
Unit	mg/Kg	mg/Kg
VOCS	ND	

Sample ID	SB-8
Sampling Depth	0-2FT 16-18FT
Sampling Date	7/24/2024 7/24/2024
Unit	mg/Kg mg/Kg
VOCs	ND

Sample ID	SP-15	
Sample Depth	0-2FT	7-9FT
Sample Date	7/16/2025	7/16/2025
Units	mg/kg	mg/kg
VOCs	ND	

Sample ID	SB-1
Sampling Depth	10-13FT
Sampling Date	10/8/2009
Compound	ug/kg
VOCs	ND

Sample ID	SB-5
Sampling Depth	18-20FT
Sampling Date	10/8/2009
Compound	ug/kg
VOCs	ND

Sample ID	PE-7
Sample Depth (fbg)	4-5FT
Sample Date	9/7/2021
Unit	mg/Kg
VOCS	ND

Sample ID	SB-2
Sampling Depth	15-17FT
Sampling Date	10/8/2009
Compound	ug/kg
VOCs	ND

Sample ID	SB-3
Sampling Depth	25-27FT
Sampling Date	10/8/2009
Compound	ug/kg
VOCs	ND

Sample ID	B-4			
Sample Depth (fbg)	20FT	UUSCO	RRSCO	PGWSCO
Sample Date	12/23/2021			
Unit	mg/Kg	mg/Kg	mg/Kg	mg/Kg
1,2,4-Trimethylbenzene	0.002	3.6	52	3.6
1,3,5-Trimethylbenzene	0.002	8.4	52	8.4
Benzene	0.001	0.06	4.8	0.06
Ethylbenzene	0.001	1	41	1
Isopropylbenzene	0.002	~	~	~
m&p-Xylene	0.001	0.26	100	1.6
Methyl t-Butyl Ether (MTBE)	0.001	0.93	100	0.93
Naphthalene	0.005	~	~	~
n-Butylbenzene	0.002	12	100	12
n-Propylbenzene	0.002	3.9	100	3.9
o-Xylene	0.001	0.26	100	1.6
p-Isopropyltoluene	0.002	~	~	~
sec-Butylbenzene	0.002	11	100	11
tert-Butylbenzene	0.002	5.9	100	5.9
Toluene	0.001	0.7	100	0.7
Total Xylenes	0.001	0.26	100	1.6

Sample ID	B-2			
Sample Depth (fbg)	20FT	UUSCO	RRSCO	PGWSCO
Sample Date	12/23/2021			
Unit	mg/Kg	mg/Kg	mg/Kg	mg/Kg
1,2,4-Trimethylbenzene	0.002	3.6	52	3.6
1,3,5-Trimethylbenzene	0.002	8.4	52	8.4
Benzene	0.001	0.06	4.8	0.06
Ethylbenzene	0.001	1	41	1
Isopropylbenzene	0.002	~	~	~
m&p-Xylene	0.001	0.26	100	1.6
Methyl t-Butyl Ether (MTBE)	0.001	0.93	100	0.93
Naphthalene	0.005	~	~	~
n-Butylbenzene	0.002	12	100	12
n-Propylbenzene	0.002	3.9	100	3.9
o-Xylene	0.001	0.26	100	1.6
p-Isopropyltoluene	0.002	~	~	~
sec-Butylbenzene	0.002	11	100	11
tert-Butylbenzene	0.002	5.9	100	5.9
Toluene	0.001	0.7	100	0.7
Total Xylenes	0.001	0.26	100	1.6

Sample ID	SP-12				
Sample Depth	0-2FT	7-9FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/15/2025	7/15/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Acetone	0.009	ND	0.05	100	0.05
Methyl acetate	0.009	ND	~	~	~

Sample ID	Disp-2
Sample Depth (fbg)	3-4FT
Sample Date	8/26/2021
Unit	mg/Kg
VOCS	ND

Sample ID	Disp-1
Sample Depth (fbg)	2-3FT
Sample Date	8/26/2021
Unit	mg/Kg
VOCS	ND

Sample ID	TP-1			
Sample Depth (fbg)	18FT	UUSCO	RRSCO	PGWSCO
Sample Date	9/7/2021			
Unit	mg/Kg	mg/Kg	mg/Kg	mg/Kg
1,2,4-Trimethylbenzene	**28**	3.6	52	3.6
1,3,5-Trimethylbenzene	7.7	8.4	52	8.4
Ethylbenzene	0.64	1	41	1
Isopropylbenzene	0.53	~	~	~
m&p-Xylene	3	0.26	100	1.6
Naphthalene	4	~	~	~
n-Butylbenzene	1.2	12	100	12
n-Propylbenzene	2.9	3.9	100	3.9
o-Xylene	0.17	0.26	100	1.6
p-Isopropyltoluene	0.27	~	~	~
sec-Butylbenzene	0.64	11	100	11
Total Xylenes	**3.17**	0.26	100	1.6

Sample ID	SP-14			
Sample Depth	16-18FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/16/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg
Acetone	0.006 J	0.05	100	0.05

Sample ID	SP-11				
Sample Depth	0-2FT	13-15FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/16/2025	7/16/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
2-Butanone	0.004 J	ND	0.12	100	0.12
Acetone	0.027	0.006 J	0.05	100	0.05

NOTE:
REFER TO FIGURE 6 FOR THE LEGEND OF SOIL PROBES

LEGEND:
ND = THIS INDICATES THE ANALYTE WAS NOT DETECTED
U = ANALYTE NOT DETECTED AT OR ABOVE THE LEVEL INDICATED
J = ANALYTE DETECTED AT OR ABOVE THE MDL(METHOD DETECTION LIMIT) BUT BELOW THE RL(REPORTING LIMIT) - DATA IS ESTIMATED
B = ANALYTE FOUND IN THE ANALYSIS BATCH BLANK
~ = NO STANDARD AVAILABLE FOR TARGET ANALYTE
NS = NOT SAMPLED
UUSCO = NYSDEC PART 375 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES
RRSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES-RESTRICTED RESIDENTIAL
PGWSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES - PROTECTION OF GROUNDWATER
INDICATES CONCENTRATION EXCEEDS PGWSCO
FT = DEPTH IN FEET BELOW EXISTING GRADE SURFACE (bgs)

0' 40'
APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 8A: SOIL SAMPLES CONTAMINATION SUMMARY FOR VOCs

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

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DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HydroTech

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

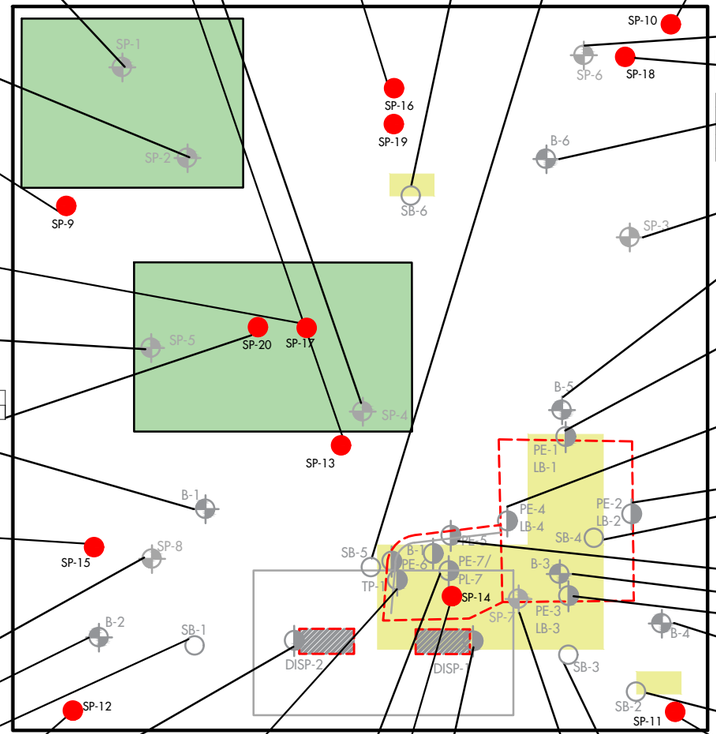
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 8B: SOIL SAMPLES CONTAMINATION SUMMARY FOR SVOCs

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY: A.S.	REVIEWED BY: P.M.
SCALE (11X17): AS SHOWN	APPROVED BY: P.M.



Sample ID	SP-1		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	2-4FT			
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Benzo(a)anthracene	0.06 JD	ND	1	1	1
Benzo(a)pyrene	0.07 JD		1	1	22
Benzo(b)fluoranthene	0.07 JD		1	1	1.7
Benzo(g,h,i)perylene	0.06 JD		100	100	1000
Benzo(k)fluoranthene	0.07 JD		0.8	3.9	1.7
Chrysene	0.08 JD		1	3.9	1
Fluoranthene	0.14 D		100	100	1000
Indeno(1,2,3-cd)pyrene	0.06 JD		0.5	0.5	8.2
Phenanthrene	0.07 JD		100	100	1000
Pyrene	0.12 D		100	100	1000

Sample ID	SP-2		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	2-4FT			
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Acenaphthene	0.05 JD	ND	20	100	98
Anthracene	0.12 D		100	100	1000
Benzo(a)anthracene	0.24 D		1	1	1
Benzo(a)pyrene	0.20 D		1	1	22
Benzo(b)fluoranthene	0.28 D		1	1	1.7
Benzo(g,h,i)perylene	0.14 D		100	100	1000
Benzo(k)fluoranthene	0.10 D		0.8	3.9	1.7
Benzyl butyl phthalate	0.39 D		~	~	~
Bis(2-ethylhexyl)phthalate	0.37 D		~	~	~
Carbazole	0.06 JD		~	~	~
Chrysene	0.24 D		1	3.9	1
Fluoranthene	0.54 D		100	100	1000
Fluorene	0.05 JD		30	100	1000
Indeno(1,2,3-cd)pyrene	0.16 D		0.5	0.5	8.2
Phenanthrene	0.57 D		100	100	1000
Pyrene	0.47 D		100	100	1000

Sample ID	SP-4		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	10-12FT			
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SVOCs	ND				

Sample ID	SP-13	UUSCO	RRSCO	PGWSCO
Sample Depth	8-10FT			
Sample Date	7/16/2025			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg
SVOCs	ND			

Sample ID	SP-19
SVOCs	NS

Sample ID	SP-16		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	8-10FT			
Sample Date	7/15/2025	7/15/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Benzo(a)anthracene	0.06 JD	ND	1	1	1
Benzo(a)pyrene	0.06 JD		1	1	22
Benzo(b)fluoranthene	0.07 JD		1	1	1.7
Benzo(g,h,i)perylene	0.06 JD		100	100	1,000
Benzo(k)fluoranthene	0.06 JD		0.8	3.9	1.7
Chrysene	0.07 JD		1	3.9	1
Fluoranthene	0.11 D		100	100	1,000
Phenanthrene	0.06 JD		100	100	1,000
Pyrene	0.10 D		100	100	1,000

Sample ID	SB-6
Sample Depth	12-15FT
Sample Date	10/8/2009
Units	ug/kg
SVOCs	ND

Sample ID	SB-5
Sample Depth	18-20FT
Sample Date	10/8/2009
Units	ug/kg
SVOCs	ND

Sample ID	SP-10
Sample Depth	5-7FT
Sample Date	7/15/2025
Units	mg/kg
SVOCs	ND

Sample ID	SP-6		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	2-4FT			
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
2-Methylnaphthalene	0.27 D	ND	~	~	~
Acenaphthene	1.39 D		20	100	98
Acenaphthylene	0.13 D		100	100	107
Anthracene	3.15 D		100	100	1000
Benzo(a)anthracene	7.16 D		1	1	1
Benzo(a)pyrene	6.45 D		1	1	22
Benzo(b)fluoranthene	5.84 D		1	1	1.7
Benzo(g,h,i)perylene	3.92 D		100	100	1000
Benzo(k)fluoranthene	2.65 D		0.8	3.9	1.7
Carbazole	1.6 D		~	~	~
Chrysene	6.83 D		1	3.9	1
Dibenzo(a,h)anthracene	0.93 D		0.33	0.33	1,000
Dibenzofuran	0.98 D		7	59	210
Fluoranthene	15.9 D		100	100	1000
Fluorene	1.27 D		30	100	1000
Indeno(1,2,3-cd)pyrene	4.13 D		0.5	0.5	8.2
Naphthalene	0.47 D		12	100	12
Phenanthrene	15.4 D		100	100	1000
Pyrene	14.5 D		100	100	1000

Sample ID	SP-18
SVOCs	NS

Sample ID	B-6
Sample Depth (fbg)	9FT
Sample Date	12/23/2021
Units	mg/Kg
SVOCs	ND

Sample ID	SP-3		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	2-4FT			
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Acenaphthene	0.12 D	ND	100	100	1000
Benzo(a)anthracene	0.24 D		1	1	1
Benzo(a)pyrene	0.20 D		1	1	22
Benzo(b)fluoranthene	0.28 D		1	1	1.7
Benzo(g,h,i)perylene	0.14 D		100	100	1000
Benzo(k)fluoranthene	0.10 D		0.8	3.9	1.7
Carbazole	0.06 JD		~	~	~
Chrysene	0.24 D		1	3.9	1
Dibenzo(a,h)anthracene	0.10 D		0.33	0.33	1000
Fluoranthene	0.54 D		100	100	1000
Indeno(1,2,3-cd)pyrene	0.16 D		0.5	0.5	8.2
Phenanthrene	0.57 D		100	100	1000
Pyrene	0.47 D		100	100	1000

Sample ID	B-5
Sample Depth (fbg)	14FT
Sample Date	12/23/2021
Units	mg/Kg
SVOCs	ND

Sample ID	SP-9
Sample Depth	12-14FT
Sample Date	7/15/2025
Units	mg/kg
SVOCs	ND

Sample ID	SP-17		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	12-14FT			
Sample Date	7/16/2025	7/16/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Fluoranthene	0.05 JD	ND	100	100	1,000
Pyrene	0.05 JD		100	100	1,000

Sample ID	SP-5		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	2-4FT			
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Acenaphthylene	0.07 JD	ND	20	100	98
Benzo(a)anthracene	0.19 D		1	1	1
Benzo(a)pyrene	0.25 D		1	1	22
Benzo(b)fluoranthene	0.23 D		1	1	1.7
Benzo(g,h,i)perylene	0.17 D		100	100	1000
Benzo(k)fluoranthene	0.24 D		0.8	3.9	1.7
Chrysene	0.22 D		1	3.9	1
Dibenzo(a,h)anthracene	0.06 JD		0.33	0.33	1000
Fluoranthene	0.32 D		100	100	1000
Indeno(1,2,3-cd)pyrene	0.15 D		0.5	0.5	8.2
Phenanthrene	0.13 D		100	100	1000
Pyrene	0.25 D		100	100	1000

Sample ID	B-1
Sample Depth(fbg)	20FT
Sample Date	12/23/2021
Units	mg/Kg
SVOCs	ND

Sample ID	SP-20
SVOCs	NS

Sample ID	PE-1	LB-1
Sample Depth (fbg)	5-6FT	3-4FT
Sample Date	8/25/2021	9/7/2021
Units	mg/Kg	mg/Kg
SVOCs	ND	

Sample ID	PE-4	LB-4
Sample Depth (fbg)	6-7FT	11-12FT
Sample Date	8/26/2021	8/26/2021
Units	mg/Kg	mg/Kg
SVOCs	ND	

Sample ID	PE-2	LB-2
Sample Depth (fbg)	7-8FT	11-12FT
Sample Date	8/25/2021	8/25/2021
Units	mg/Kg	mg/Kg
SVOCs	ND	

Sample ID	SB-4
Sample Depth	11-13FT
Sample Date	10/8/2009
Units	ug/kg
SVOCs	ND

Sample ID	PE-5
Sample Depth (fbg)	3-4FT
Sample Date	9/7/2021
Units	mg/Kg
SVOCs	ND

Sample ID	B-3
Sample Depth (fbg)	15FT
Sample Date	12/23/2021
Units	mg/Kg
SVOCs	ND

Sample ID	SP-15		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	7-9FT			
Sample Date	7/16/2025	7/16/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Benzo(a)anthracene	0.1 D	ND	1	1	1
Benzo(a)pyrene	0.1 D		1	1	22
Benzo(b)fluoranthene	0.11 D		1	1	1.7
Benzo(g,h,i)perylene	0.07 JD		100	100	1,000
Benzo(k)fluoranthene	0.11 D		0.8	3.9	1.7
Chrysene	0.12 D		1	3.9	1
Fluoranthene	0.16 D		100	100	1,000
Indeno(1,2,3-cd)pyrene	0.05 JD		0.5	0.5	8.2
Phenanthrene	0.06 JD		100	100	1,000
Pyrene	0.16 D		100	100	1,000

Sample ID	B-4
Sample Depth (fbg)	18FT
Sample Date	12/23/2021
Units	mg/Kg
SVOCs	ND

Sample ID	PE-3	LB-3
Sample Depth (fbg)	7-8FT	11-12FT
Sample Date	8/26/2021	8/26/2021
Units	mg/Kg	mg/Kg
SVOCs	ND	

Sample ID	SB-2
Sample Depth	15-17FT
Sample Date	10/8/2009
Units	ug/kg
SVOCs	ND

Sample ID	SP-8		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	16-18FT			
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Benzo(a)anthracene	0.07 D	ND	1	1	1
Benzo(a)pyrene	0.06 D		1	1	22
Benzo(b)fluoranthene	0.09 D		1	1	1.7
Chrysene	0.07 D		1	3.9	1
Fluoranthene	0.10 D		100	100	1000
Indeno(1,2,3-cd)pyrene	0.06 D		0.5	0.5	8.2
Phenanthrene	0.05 D		100	100	1000
Pyrene	0.10 D		100	100	1000

Sample ID	SB-1
Sample Depth	10-13FT
Sample Date	10/8/2009
Units	ug/kg
SVOCs	ND

Sample ID	Disp-2
Sample Depth (fbg)	3-4FT
Sample Date	8/26/2021
Units	mg/Kg
SVOCs	ND

Sample ID	PE-7
Sample Depth (fbg)	4-5FT
Sample Date	9/7/2021
Units	mg/Kg
SVOCs	ND

Sample ID	Disp-1
Sample Depth (fbg)	2-3FT
Sample Date	8/26/2021
Units	mg/Kg
SVOCs	ND

Sample ID	SB-3
Sample Depth	25-27FT
Sample Date	10/8/2009
Units	ug/kg
SVOCs	ND

Sample ID	TP-1		UUSCO	RRSCO	PGWSCO
Sample Depth (fbg)	18FT				
Sample Date	9/7/2021				
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Naphthalene	1	12	100	100	12

Sample ID	SP-14
Sample Depth	16-18FT
Sample Date	7/16/2025
Units	mg/kg
SVOCs	ND

Sample ID	SP-7		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	2-4FT			
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Benzo(a)anthracene	0.13 D	ND	1	1	1
Benzo(a)pyrene	0.13 D		1	1	22
Benzo(b)fluoranthene	0.17 D		1	1	1.7
Benzo(g,h,i)perylene	0.09 JD	0.05 JD	100	100	1000
Benzo(k)fluoranthene	0.06 JD	ND	0.8	3.9	1.7
Chrysene	0.15 D		1	3.9	1
Fluoranthene	0.27 D		100	100	1000
Indeno(1,2,3-cd)pyrene	0.1 D		0.5	0.5	8.2
Phenanthrene	0.13 D		100	100	1000
Pyrene	0.26 D	0.05 JD	100	100	1000

Sample ID	SP-11		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	13-15FT			
Sample Date	7/16/2025	7/16/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Benzo(a)anthracene	0.08 JD	ND	1	1	1
Benzo(a)pyrene	0.08 JD		1	1	22
Benzo(b)fluoranthene	0.08 JD		1	1	1.7
Benzo(g,h,i)perylene	0.06 JD		100	100	1,000
Benzo(k)fluoranthene	0.07 JD		0.8	3.9	1.7
Chrysene	0.09 D		1	3.9	1
Fluoranthene	0.10 D		100	100	1,000
Pyrene	0.12 D		100	100	1,000

Sample ID	SP-12		UUSCO	RRSCO	PGWSCO
Sample Depth	0-2FT	7-9FT			
Sample Date	7/15/2025	7/15/2025			
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Benzo(a)anthracene	0.07 JD	ND	1	1	1
Benzo(a)pyrene	0.10 D		1	1	22
Benzo(b)fluoranthene	0.11 D		1	1	1.7
Benzo(g,h,i)perylene	0.09 JD		100	100	1,000
Benzo(k)fluoranthene	0.10 D		0.8	3.9	1.7
Bis(2-ethylhexyl)phthalate	0.06 JD		~	~	~
Chrysene	0.08 JD		1	3.9	1
Fluoranthene	0.07 JD		100	100	1,000
Indeno(1,2,3-cd)pyrene	0.06 JD		0.5	0.5	8.2
Pyrene	0.08 JD		100	100	1,000

Sample ID	B-2			
Sample Depth (fbg)	20FT	UUSCO	RRSCO	PGWSCO
Sample Date	12/23/2021			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Benzo(a)pyrene	0.04	1	1	22
Indeno(1,2,3-cd)pyrene	0.04	0.5	0.5	8.2

LEGEND:
ND = THIS INDICATES THE ANALYTE WAS NOT DETECTED
D = RESULT IS FROM AN ANALYSIS THAT REQUIRED A DILUTION
J = ANALYTE DETECTED AT OR ABOVE THE MDL(METHOD DETECTION LIMIT) BUT BELOW THE RL(REPORTING LIMIT) - DATA IS ESTIMATED
~ = NO STANDARD AVAILABLE FOR TARGET ANALYTE
NS = NOT SAMPELD
UUSCO = NYSDEC PART 375 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES
RRSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES-RESTRICTED RESIDENTIAL
PGWSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES - PROTECTION OF GROUNDWATER

INDICATES CONCENTRATION EXCEEDS PGWSCO
INDICATES CONCENTRATION EXCEEDS RRSCO
FT = DEPTH IN FEET BELOW EXISTING GRADE SURFACE (bgs)

NOTE:
REFER TO FIGURE 6 FOR THE LEGEND OF SOIL PROBES

0' 40'
APPROXIMATE SCALE IN FEET

Sample ID	SP-2				
Sample Depth	0-2FT	10-12FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	11,700	12,400	~	~	~
Arsenic	8.92	1.6	13	16	16
Barium	95.6	80.2	350	400	820
Beryllium	0.3	ND	7.2	72	47
Cadmium	0.99	ND	2.5	4.3	7.5
Calcium	13,400	3,770	~	~	~
Chromium, Trivalent	17.5	29.5	30	180	~
Cobalt	7.39	12.8	~	~	~
Copper	50.4	71.8	50	270	1720
Iron	15,300	20,100	~	~	~
Lead	104	2.93	63	400	450
Magnesium	3,930	6,410	~	~	~
Manganese	210	345	1600	2000	2000
Mercury	0.16	ND	0.18	0.81	0.73
Nickel	18.9	25.4	30	310	130
Potassium	2,040	3,250	~	~	~
Sodium	294	279	~	~	~
Vanadium	25.8	42.2	~	~	~
Zinc	346	47.9	109	10000	2480

Sample ID	SP-5				
Sample Depth	0-2FT	10-12FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	12,100	18,800	~	~	~
Arsenic	5.48	1.78	13	16	16
Barium	120	109	350	400	820
Beryllium	0.17	0.27	7.2	72	47
Calcium	3,780	3,160	~	~	~
Chromium, Trivalent	27.8	96.7	30	180	~
Cobalt	11.4	13.3	~	~	~
Copper	42.5	28.6	50	270	1720
Iron	23,600	23,700	~	~	~
Lead	102	5.62	63	400	450
Magnesium	4,530	12,000	~	~	~
Manganese	303	362	1600	2000	2000
Mercury	0.11	ND	0.18	0.81	0.73
Nickel	38.4	50.6	30	310	130
Potassium	2,080	2,120	~	~	~
Sodium	245	233	~	~	~
Vanadium	34	39.6	~	~	~
Zinc	112	62.1	109	10000	2480

Sample ID	SP-8				
Sample Depth	0-2FT	16-18FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	13,500	11,500	~	~	~
Arsenic	4.11	1.75	13	16	16
Barium	138	111	350	400	820
Beryllium	0.26	ND	7.2	72	47
Cadmium	0.53	ND	2.5	4.3	7.5
Calcium	12,200	3,080	~	~	~
Chromium, Trivalent	33.5	32.2	30	180	~
Cobalt	9.2	11.3	~	~	~
Copper	43	44.1	50	270	1720
Iron	19,000	17,500	~	~	~
Lead	177	3.31	63	400	450
Magnesium	5,080	5,840	~	~	~
Manganese	390	266	1600	2000	2000
Mercury	0.06	ND	0.18	0.81	0.73
Nickel	23.8	27.7	30	310	130
Potassium	2,390	2,930	~	~	~
Sodium	333	373	~	~	~
Vanadium	39	36.5	~	~	~
Zinc	115	39.1	109	10000	2480

Sample ID	SP-1				
Sample Depth	0-2FT	2-4FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	16,700	18,000	~	~	~
Arsenic	5.1	3.31	13	16	16
Barium	129	59.4	350	400	820
Beryllium	0.36	0.33	7.2	72	47
Calcium	11,500	1,580	~	~	~
Chromium, Trivalent	21.9	31.6	30	180	~
Cobalt	8.6	10.8	~	~	~
Copper	19.2	28	50	270	1,720
Iron	19,700	22,200	~	~	~
Lead	42.1	7.25	63	270	1,720
Magnesium	4,350	5,970	~	~	~
Manganese	282	318	1,600	2,000	2,000
Mercury	0.11	0.06	0.18	0.81	0.73
Nickel	16.4	23.5	30	310	130
Potassium	1,730	1,300	~	~	~
Sodium	327	232	~	~	~
Vanadium	32.1	39.9	~	~	~
Zinc	83.6	73.8	109	10,000	2,480

Sample ID	SP-4				
Sample Depth	0-2FT	10-12FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	**23,100**	**12,300**	~	~	~
Arsenic	**4.1**	**3.07**	13	16	16
Barium	**190**	**47**	350	400	820
Beryllium	**0.36**	**0.20**	7.2	72	47
Calcium	**2,750**	**1,960**	~	~	~
Chromium, Trivalent	**55.4**	**29.7**	30	180	~
Cobalt	**13**	**11.2**	~	~	~
Copper	**31**	**23.4**	50	270	1720
Iron	**31,600**	**19,100**	~	~	~
Lead	**10.3**	**18.2**	63	400	450
Magnesium	**7,110**	**6,430**	~	~	~
Manganese	**164**	**471**	1600	2000	2000
Mercury	**0.04**	0.0319	0.18	0.81	0.73
Nickel	**31.5**	**23**	30	310	130
Potassium	**2,070**	**1,760**	~	~	~
Sodium	**362**	**173**	~	~	~
Vanadium	**75.6**	**33.9**	~	~	~
Zinc	**63.7**	**43**	109	10000	2480

Sample ID	SP-16				
Sample Depth	0-2FT	8-10FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/15/2025	7/15/2025			
Units	mg/kg	mg/kg	mg/Kg	mg/Kg	mg/Kg
Barium	96.3	111	350	400	820
Chromium, Trivalent	23.2	26.1	30	180	~
Copper	31.8	48.2	50	270	1,720
Lead	66.3	15.8	63	400	450
Nickel	19.8	21.5	30	310	130
Zinc	71.4	69.5	109	10,000	2,480

Sample ID	SP-17				
Sample Depth	0-2FT	12-14FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/16/2025	7/16/2025			
Units	mg/kg	mg/kg	mg/Kg	mg/Kg	mg/Kg
Barium	115	88.4	350	400	820
Chromium, Trivalent	41	24.8	30	180	~
Copper	32	30.3	50	270	1,720
Lead	29.3	3.01	63	400	450
Nickel	23.9	17	30	310	130
Zinc	116	41	109	10,000	2,480

Sample ID	SB-6
Sampling Depth	12-15'
Sampling Date	10/8/2009
Compound	ug/kg
METALS	NT

Sample ID	SB-5
Sampling Depth	18-20'
Sampling Date	10/8/2009
Compound	ug/kg
METALS	NT

Sample ID	SP-19
METALS	NS

Sample ID	SP-10			
Sample Depth	5-7FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/15/2025			
Units	mg/kg	mg/Kg	mg/Kg	mg/Kg
Barium	542	350	400	820
Chromium, Trivalent	178	30	180	~
Copper	51.8	50	270	1,720
Lead	7.3	63	400	450
Nickel	98.9	30	310	130
Zinc	148	109	10,000	2,480

Sample ID	SP-6				
Sample Depth	0-2FT	2-4FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	13,900	29,700	~	~	~
Arsenic	8.52	1.78	13	16	16
Barium	228	392	350	400	820
Beryllium	0.55	ND	7.2	72	47
Cadmium	1.64	ND	2.5	4.3	7.5
Calcium	15,100	3,380	~	~	~
Chromium, Trivalent	26.6	214	30	180	~
Cobalt	8.14	26.9	~	~	~
Copper	70.9	29.1	50	270	1720
Iron	17,400	39,800	~	~	~
Lead	279	3.12	63	400	450
Magnesium	6,710	21,400	~	~	~
Manganese	342	198	1600	2000	2000
Mercury	0.22	ND	0.18	0.81	0.73
Nickel	28.1	100	30	310	130
Potassium	1,660	9,110	~	~	~
Sodium	463	730	~	~	~
Vanadium	34.7	143	~	~	~
Zinc	190	116	109	10000	2480

Sample ID	SP-18
METALS	NS

Sample ID	B-6
Sample Depth (fbg)	9FT
Sample Date	12/23/2021
Units	mg/Kg
METALS	NT

Sample ID	SP-3				
Sample Depth	0-2FT	10-12FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	20,400	9,790	~	~	~
Arsenic	4.88	ND	13	16	16
Barium	129	70.6	350	400	820
Beryllium	0.5	0.11	7.2	72	47
Calcium	3,210	1,270	~	~	~
Chromium, Trivalent	29	27.9	30	180	~
Cobalt	9.57	11.8	~	~	~
Copper	17.4	30.2	50	270	1720
Iron	20,800	14,400	~	~	~
Lead	21.8	2.93	63	400	450
Magnesium	4,490	3,880	~	~	~
Manganese	619	338	1600	2000	2000
Mercury	0.09	ND	0.18	0.81	0.73
Nickel	20.5	39.6	30	310	130
Potassium	1,260	2,760	~	~	~
Sodium	237	150	~	~	~
Vanadium	38.5	34.3	~	~	~
Zinc	57.1	44.5	109	10000	2480

Sample ID	SP-9				
Sample Depth	12-14FT	UUSCO	RRSCO	PGWSCO	
Sample Date	7/15/2025				
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	
Barium	222	350	400	820	
Chromium, Trivalent	28.4	30	180	~	
Copper	27	50	270	1,720	
Lead	1.81	63	400	450	
Nickel	26.6	30	310	130	
Zinc	72.3	109	10,000	2,480	

Sample ID	SP-20
METALS	NS

Sample ID	SP-13				
Sample Depth	8-10FT	UUSCO	RRSCO	PGWSCO	
Sample Date	7/16/2025				
Units	mg/kg	mg/Kg	mg/Kg	mg/Kg	
Barium	53.5	350	400	820	
Chromium, Trivalent	32.1	30	180	~	
Copper	23	50	270	1,720	
Lead	8.56	63	400	450	
Nickel	22	30	310	130	
Zinc	58.8	109	10,000	2,480	

Sample ID	B-1
Sample Depth (fbg)	20FT
Sample Date	12/23/2021
Units	mg/Kg
METALS	NT

Sample ID	SP-15				
Sample Depth	0-2FT	7-9FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/16/2025	7/16/2025			
Units	mg/kg	mg/kg	mg/Kg	mg/Kg	mg/Kg
Barium	142	**55.4**	350	400	820
Chromium, Trivalent	19.7	**21.9**	30	180	~
Copper	92.3	**35.5**	50	270	1,720
Lead	268	**3.29**	63	400	450
Nickel	22.1	**28**	30	310	130
Zinc	263	**38.6**	109	10,000	2,480

Sample ID	B-2
Sample Depth (fbg)	20FT
Sample Date	12/23/2021
Units	mg/Kg
METALS	NT

Sample ID	SB-1
Sample Depth	10-13FT
Sample Date	10/8/2009
Units	ug/kg
METALS	NT

Sample ID	SP-12				
Sample Depth	0-2FT	7-9FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/15/2025	7/15/2025			
Units	mg/kg	mg/kg	mg/Kg	mg/Kg	mg/Kg
Barium	87.7	82.1	350	400	820
Chromium, Trivalent	23.7	140	30	180	~
Copper	58.3	41.8	50	270	1,720
Lead	96	3.84	63	400	450
Nickel	24.2	44.5	30	310	130
Zinc	93.9	57	109	10,000	2,480

Sample ID	Disp-2
Sample Depth (fbg)	3-4FT
Sample Date	8/26/2021
Units	mg/Kg
METALS	NT

Sample ID	TP-1
Sample Depth (fbg)	18FT
Sample Date	9/7/2021
Units	mg/Kg
METALS	NT

Sample ID	PE-7
Sample Depth (fbg)	4-5FT
Sample Date	9/7/2021
Units	mg/Kg
METALS	NT

Sample ID	Disp-1
Sample Depth (fbg)	2-3FT
Sample Date	8/26/2021
Units	mg/Kg
METALS	NT

Sample ID	PE-5
Sample Depth (fbg)	3-4FT
Sample Date	9/7/2021
Units	mg/Kg
METALS	NT

Sample ID	SP-14				
Sample Depth	16-18FT	UUSCO	RRSCO	PGWSCO	
Sample Date	7/16/2025				
Units	mg/kg	mg/Kg	mg/Kg	mg/Kg	
Barium	83.1	350	400	820	
Chromium, Trivalent	24.5	30	180	~	
Copper	26.7	50	270	1,720	
Lead	6.45	63	400	450	
Nickel	25.8	30	310	130	
Zinc	39	109	10,000	2,480	

Sample ID	SB-2
Sample Depth	15-17FT
Sample Date	10/8/2009
Units	ug/kg
METALS	NT

Sample ID	SB-3
Sample Depth	25-27FT
Sample Date	10/8/2009
Units	ug/kg
METALS	NT

Sample ID	SP-7				
Sample Depth	0-2FT	10-12FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/24/2024	7/24/2024			
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	11,000	7,890	~	~	~
Arsenic	4.02	2.3	13	16	16
Barium	89.3	49.2	350	400	820
Beryllium	0.09	0.08	7.2	72	47
Calcium	42,700	45,900	~	~	~
Chromium, Trivalent	25.5	16.5	30	180	~
Cobalt	7.42	5.72	~	~	~
Copper	25.8	18.4	50	270	1720
Iron	16,900	16,800	~	~	~
Lead	39.2	100	63	400	450
Magnesium	12,200	13,600	~	~	~
Manganese	283	1,010	1600	2000	2000
Mercury	0.14	ND	0.18	0.81	0.73
Nickel	16.6	11.9	30	310	130
Potassium	2,930	2,390	~	~	~
Sodium	258	141	~	~	~
Vanadium	32.2	21.8	~	~	~
Zinc	73.9	44.2	109	10000	2480

Sample ID	PE-1	LB-1
Sample Depth (fbg)	5-6FT	3-4FT
Sample Date	8/25/2021	9/7/2021
Units	mg/Kg	mg/Kg
METALS	NT	

Sample ID	PE-4	LB-4
Sample Depth (fbg)	6-7FT	11-12FT
Sample Date	8/26/2021	8/26/2021
Units	mg/Kg	mg/Kg
METALS	NT	

Sample ID	PE-2	LB-2
Sample Depth	7-8FT	11-12FT
Sample Date	8/25/2021	8/25/2021
Units	mg/Kg	mg/Kg
METALS	NT	

Sample ID	SB-4
Sample Depth	11-13FT
Sample Date	10/8/2009
Units	ug/kg
METALS	NT

Sample ID	B-3
Sample Depth (fbg)	15FT
Sample Date	12/23/2021
Units	mg/Kg
METALS	NT

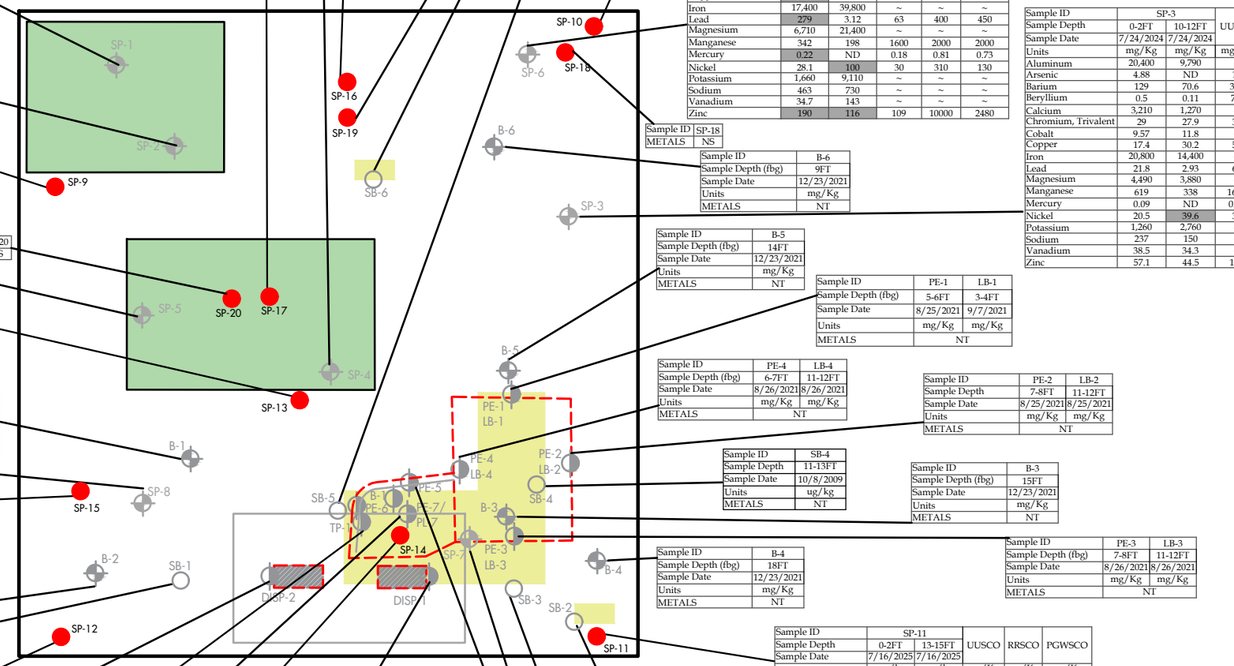
Sample ID	B-4
Sample Depth (fbg)	18FT
Sample Date	12/23/2021
Units	mg/Kg
METALS	NT

Sample ID	PE-3	LB-3
Sample Depth (fbg)	7-8FT	11-12FT
Sample Date	8/26/2021	8/26/2021
Units	mg/Kg	mg/Kg
METALS	NT	

Sample ID	SP-11				
Sample Depth	0-2FT	13-15FT	UUSCO	RRSCO	PGWSCO
Sample Date	7/16/2025	7/16/2025			
Units	mg/kg	mg/kg	mg/Kg	mg/Kg	mg/Kg
Barium	106	141	350	400	820
Chromium, Trivalent	44.3	35.3	30	180	~
Copper	40	28.3	50	270	1,720
Lead	42	3.85	63	400	450
Nickel	25.4	47.4	30	310	130
Zinc	78	46	109	10,000	2,480

LEGEND:
- ND = THIS INDICATES THE ANALYTE WAS NOT DETECTED
- D = RESULT IS FROM AN ANALYSIS THAT REQUIRED A DILUTION
- J = ANALYTE DETECTED AT OR ABOVE THE MDL(METHOD DETECTION LIMIT) BUT BELOW THE RL(REPORTING LIMIT) - DATA IS ESTIMATED
- ~ = NO STANDARD AVAILABLE FOR TARGET ANALYTE
- NS = NOT SAMPLED
- NT = NO TARGET ANALYTE
- UUSCO = NYSDEC PART 375 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES
- RRSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES- RESTRICTED RESIDENTIAL
- PGWSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES - PROTECTION OF GROUNDWATER
- INDICATES CONCENTRATION EXCEEDS UUSCO
- INDICATES CONCENTRATION EXCEEDS RRSCO
- FT = DEPTH IN FEET BELOW EXISTING GRADE SURFACE (bgs)

NOTE:
REFER TO FIGURE 6 FOR THE LEGEND OF SOIL PROBES



0' 40'
APPROXIMATE SCALE IN FEET

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231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

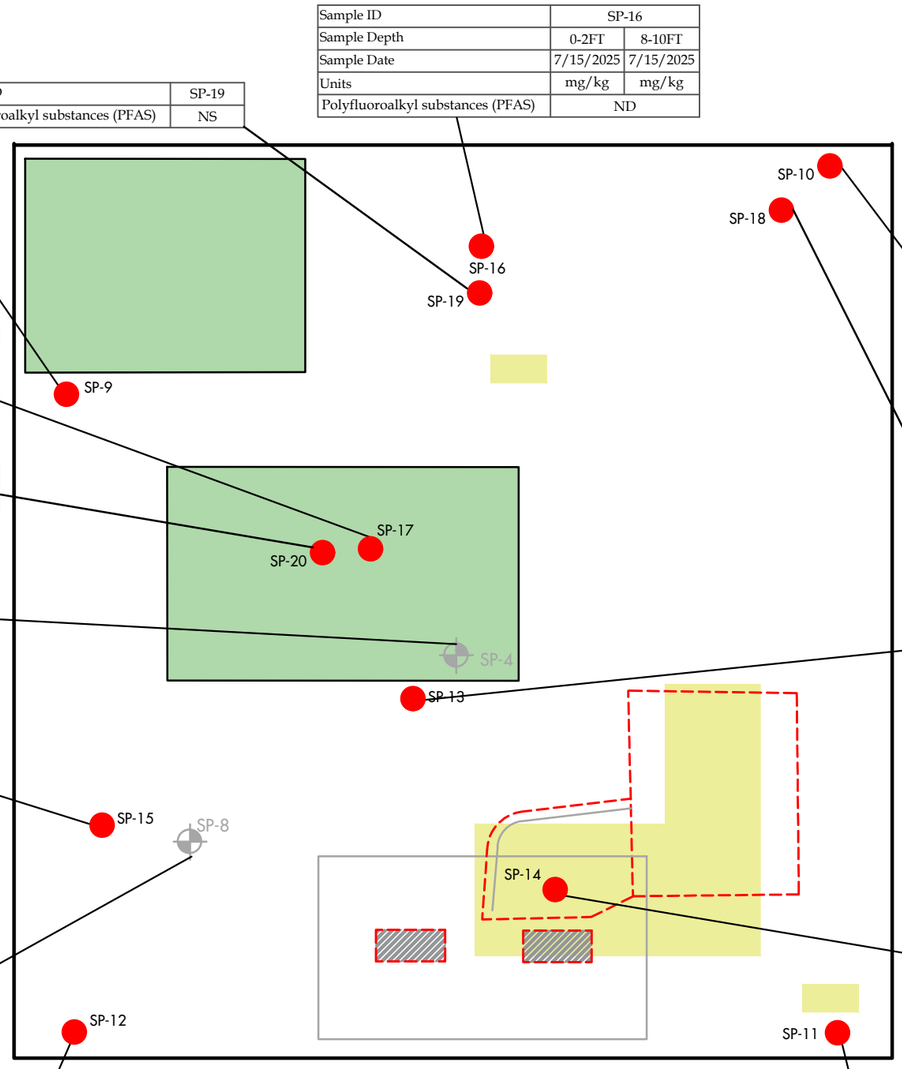
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 8C: SOIL SAMPLES CONTAMINATION SUMMARY FOR METALS

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



Sample ID	SP-16	
Sample Depth	0-2FT	8-10FT
Sample Date	7/15/2025	7/15/2025
Units	mg/kg	mg/kg
Polyfluoroalkyl substances (PFAS)	ND	

Sample ID	SP-19
Polyfluoroalkyl substances (PFAS)	NS

Sample ID	SP-9
Sample Depth	12-14FT
Sample Date	7/15/2025
Units	mg/kg
Polyfluoroalkyl substances (PFAS)	ND

Sample ID	SP-17	
Sample Depth	0-2FT	12-14FT
Sample Date	7/16/2025	7/16/2025
Units	mg/kg	mg/kg
Polyfluoroalkyl substances (PFAS)	ND	

Sample ID	SP-20
Polyfluoroalkyl substances (PFAS)	NS

Sample ID	SP-10	Soil Guidance Value		
Sample Depth	5-7FT			
Sample Date	7/15/2025	Unrestricted Site Use	Restricted Site Use	Protection of Groundwater
Units	mg/kg			
Perfluorooctanoic acid (PFOA)	0.0001 J	0.00066	0.033	0.0008

Sample ID	SP-18
Polyfluoroalkyl substances (PFAS)	NS

Sample ID	SP-4	SP-4	Soil Guidance Value		
Sample Depth	0-2FT	10-12FT			
Sample Date	7/24/2024	7/24/2024	Unrestricted Site Use	Restricted Site Use	Protection of Groundwater
Units	mg/Kg	mg/Kg			
Perfluorooctanesulfonic acid (PFOS)	ND	0.00018 U	0.00088	0.044	0.001

Sample ID	SP-13
Sample Depth	8-10FT
Sample Date	7/16/2025
Units	mg/kg
Polyfluoroalkyl substances (PFAS)	ND

Sample ID	SP-15		Soil Guidance Value		
Sample Depth	0-2FT	7-9FT			
Sample Date	7/16/2025	7/16/2025	Unrestricted Site Use	Restricted Site Use	Protection of Groundwater
Units	mg/kg	mg/kg			
Perfluorooctanesulfonic acid (PFOS)	0.0004	ND	0.00088	0.044	0.001
Perfluorooctanoic acid (PFOA)	0.0007		0.00066	0.033	0.0008

Sample ID	SP-8	SP-8	Soil Guidance Value		
Sample Depth	0-2FT	10-12FT			
Sample Date	7/24/2024	7/24/2024	Unrestricted Site Use	Restricted Site Use	Protection of Groundwater
Units	mg/Kg	mg/Kg			
Perfluorooctanesulfonic acid (PFOS)	0.00039	0.00017 U	0.00088	0.044	0.001

Sample ID	SP-14
Sample Depth	16-18FT
Sample Date	7/16/2025
Units	mg/kg
Polyfluoroalkyl substances (PFAS)	ND

WEBSTER AVENUE

Sample ID	SP-12		Soil Guidance Value		
Sample Depth	0-2FT	7-9FT			
Sample Date	7/15/2025	7/15/2025	Unrestricted Site Use	Restricted Site Use	Protection of Groundwater
Units	mg/kg	mg/kg			
Perfluorooctanesulfonic acid (PFOS)	0.0007	ND	0.00088	0.044	0.001

Sample ID	SP-11		Soil Guidance Value		
Sample Depth	0-2FT	13-15FT			
Sample Date	7/16/2025	7/16/2025	Unrestricted Site Use	Restricted Site Use	Protection of Groundwater
Units	mg/kg	mg/kg			
Perfluorooctanesulfonic acid (PFOS)	0.0001 J	ND	0.00088	0.044	0.001
Perfluorooctanoic acid (PFOA)	0.0001 J		0.00066	0.033	0.0008

LEGEND:
- ND = THIS INDICATES THE ANALYTE WAS NOT DETECTED
- U = ANALYTE NOT DETECTED AT OR ABOVE THE LEVEL INDICATED
- J = ANALYTE DETECTED AT OR ABOVE THE MDL(METHOD DETECTION LIMIT) BUT BELOW THE RL(REPORTING LIMIT) - DATA IS ESTIMATED
- ~ = NO STANDARD AVAILABLE FOR TARGET ANALYTE
- NS = NOT SAMPLED
- INDICATES CONCENTRATION EXCEEDS UNRESTRICTED SITE USE SOIL GUIDANCE VALUE
- FT = DEPTH IN FEET BELOW EXISTING GRADE SURFACE (bgs)

NOTE:
REFER TO FIGURE 6 FOR THE LEGEND OF SOIL PROBES

0' 40'
APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

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TEL: (631) 462-5866

BASE DRAWING PREPARED BY

WEXLER ASSOCIATES-CONSULTING STRUCTURAL ENGINEERS

PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 8D: SOIL SAMPLES CONTAMINATION SUMMARY FOR PFAS

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

Sample ID	MW-1a	AWQS - TOGS
Sample Date	8/6/2025	1.1.1
Units	ug/L	ug/L
Chloroform	3.1	7
cis-1,2-Dichloroethylene	2.28	5
Tetrachloroethylene	7.33	5
Trichloroethylene	3.55	5

Sample ID	MW-2a	AWQS - TOGS
Sample Date	8/6/2025	1.1.1
Units	ug/L	ug/L
Chloroform	0.28 J	7
cis-1,2-Dichloroethylene	19.4	5
Tetrachloroethylene	30.3	5
trans-1,2-Dichloroethylene	4.04	5
Trichloroethylene	40.7	5

Sample ID	MW-10	AWQS - TOGS
Sampling Date	1/14/2026	1.1.1
Units	ug/L	ug/L
cis-1,2-Dichloroethylene	14.90	5
tert-Butylbenzene	0.49 J	5
Tetrachloroethylene	69.30	5
trans-1,2-Dichloroethylene	1.61	5
Trichloroethylene	37.10	5

Sample ID	MW-9	AWQS - TOGS
Sample Date	8/7/2025	1.1.1
Units	ug/L	ug/L
1,2,4- trimethylbenzene	0.81	5
Acetone	2.27	50
Chloroform	4.7	7
n-Propylbenzene	0.52	5
Tetrachloroethylene	0.24 J	5
Toluene	5.85	5

Sample ID	MW-8	AWQS - TOGS
Sample Date	8/6/2025	1.1.1
Units	ug/L	ug/L
Chloroform	0.36 J	7
cis-1,2-Dichloroethylene	0.3 J	5
Tetrachloroethylene	3.01	5
Trichloroethylene	1.8	5

Sample ID	MW-12	AWQS - TOGS
Sampling Date	1/14/2026	1.1.1
Units	ug/L	ug/L
Chloroform	2.45	7
cis-1,2-Dichloroethylene	4.35	5
Tetrachloroethylene	3.83	5
trans-1,2-Dichloroethylene	0.28 J	5
Trichloroethylene	5.07	5

Sample ID	MW-11	AWQS - TOGS
Sampling Date	1/14/2026	1.1.1
Units	ug/L	ug/L
Chloroform	0.46 J	7
cis-1,2-Dichloroethylene	9.68	5
Tetrachloroethylene	70.60	5
trans-1,2-Dichloroethylene	1.04	5
Trichloroethylene	46.50	5

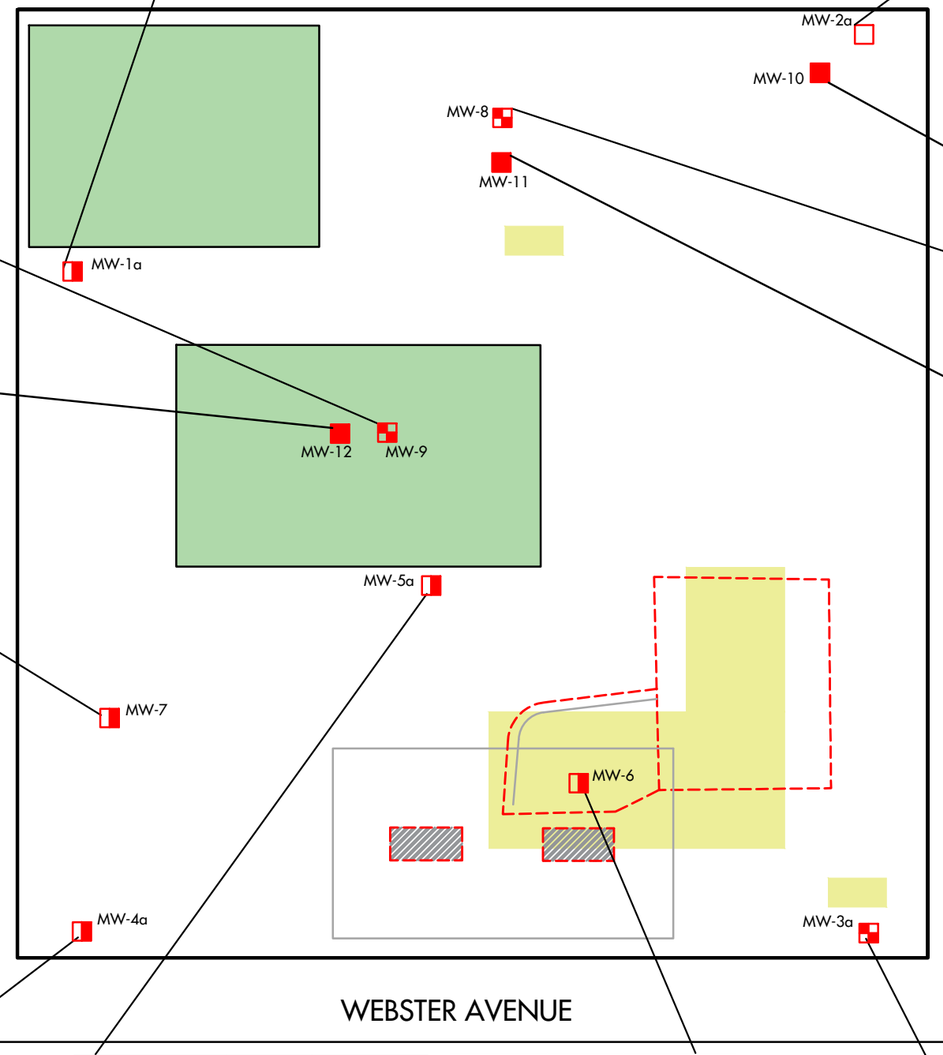
Sample ID	MW-7	AWQS - TOGS
Sample Date	8/7/2025	1.1.1
Units	ug/L	ug/L
1,2,4- trimethylbenzene	26.2	5
Acetone	1.92 J	50
Chloroform	2.94	7
cis-1,2-Dichloroethylene	3.33	5
Cyclohexane	1.19	~
Ethyl Benzene	4.28	5
Isopropylbenzene	4.22	5
Methylcyclohexane	0.77	~
n-Butylbenzene	1.03	5
n-Propylbenzene	12.2	5
p- & m- Xylenes	1.81	~
sec-Butylbenzene	1.01	5
Tetrachloroethylene	10.5	5
Trichloroethylene	4.35	5
Xylenes, Total	1.81	5

Sample ID	MW-4a	AWQS - TOGS
Sample Date	8/7/2025	1.1.1
Units	ug/L	ug/L
1,2,4- trimethylbenzene	246 D	5
1,3,5- trimethylbenzene	66.8	5
Acetone	4.1	50
cis-1,2-Dichloroethylene	1.35	5
Cyclohexane	70.6	~
Ethyl Benzene	68.4	5
Isopropylbenzene	66.5	5
Methylcyclohexane	28.2	~
n-Butylbenzene	34.8	5
n-Propylbenzene	170 D	5
o-Xylene	1.9	5
p- & m- Xylenes	96	~
p-Isopropyltoluene	4.23	5
sec-Butylbenzene	23.8	5
tert-Butylbenzene	0.52	5
Tetrachloroethylene	1.44	5
Toluene	0.36 J	5
Trichloroethylene	2.02	5
Xylenes, Total	97.9	5

Sample ID	MW-5a	AWQS - TOGS
Sample Date	8/5/2025	1.1.1
Units	ug/L	ug/L
Chloroform	0.53	7
Tetrachloroethylene	0.29 J	5

Sample ID	MW-6	AWQS - TOGS
Sample Date	8/5/2025	1.1.1
Units	ug/L	ug/L
Acetone	1.65 J	50
Chloroform	0.7	7
Cyclohexane	1.97	~

Sample ID	MW-3a	AWQS - TOGS
Sample Date	8/5/2025	1.1.1
Units	ug/L	ug/L
cis-1,2-Dichloroethylene	0.88	5



LEGEND:
- ND = NOT DETECTED
- D = RESULT IS FROM AN ANALYSIS THAT REQUIRED A DILUTION
- J = ANALYTE DETECTED AT OR ABOVE THE MDL(METHOD DETECTION LIMIT) BUT BELOW THE RL(REPORTING LIMIT) - DATA IS ESTIMATED
- NS = NOT SAMPLED
- AWQS - TOGS 1.1.1 = NYSDEC 6 NYCRR PART 703 AMBIENT WATER QUALITY STANDARDS - TECHNICAL AND OPERATIONAL GUIDANCE SERIES 1.1.1
- INDICATES CONCENTRATION EXCEEDS AWQS

NOTE:
REFER TO FIGURE 6 FOR THE LEGEND OF MONITORING WELLS

0' 40'
APPROXIMATE SCALE IN FEET

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BASE DRAWING PREPARED BY

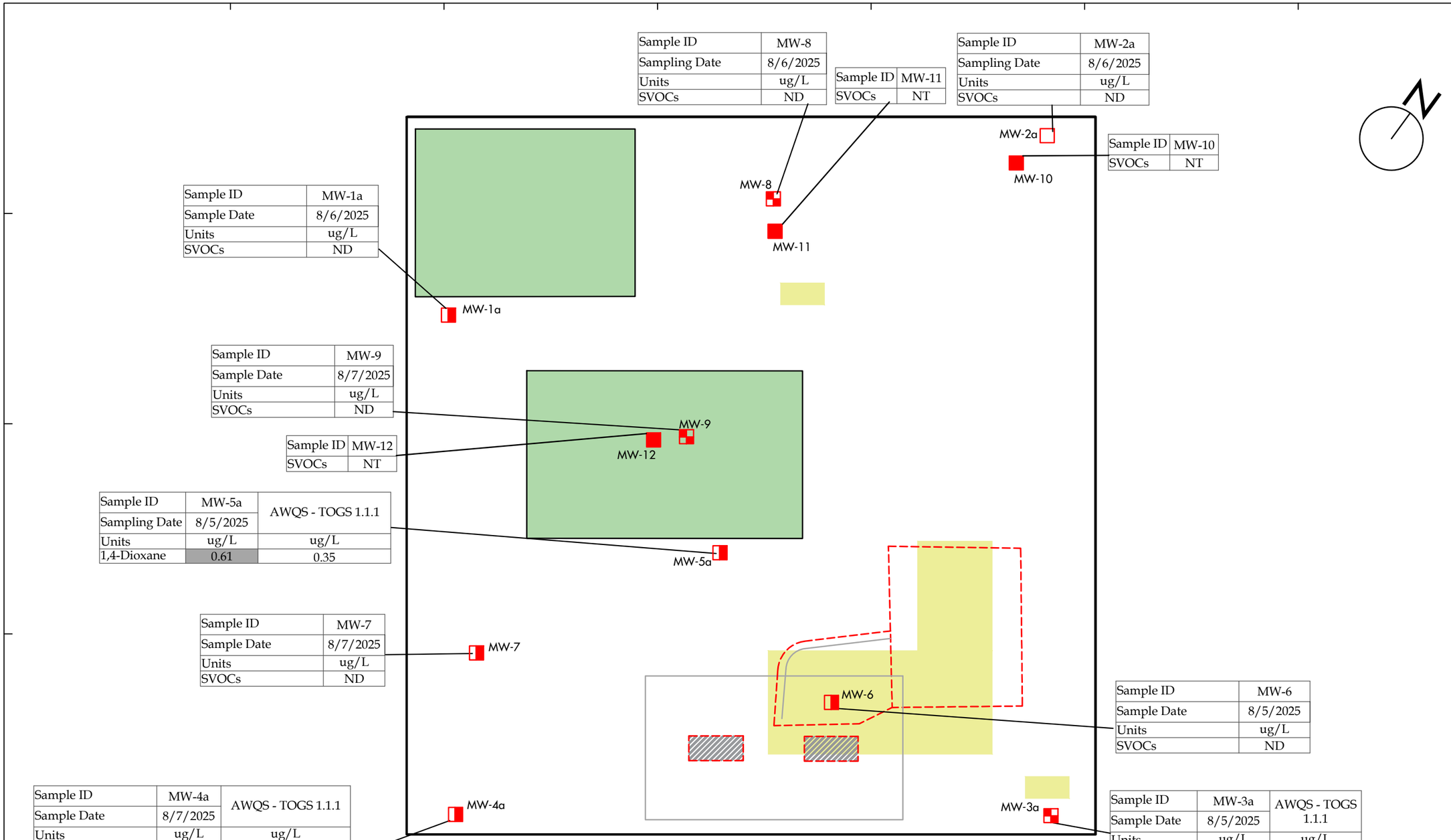
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 9A: GROUNDWATER SAMPLES CONTAMINATION SUMMARY FOR VOCs

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



Sample ID	MW-8
Sampling Date	8/6/2025
Units	ug/L
SVOCs	ND

Sample ID	MW-11
SVOCs	NT

Sample ID	MW-2a
Sampling Date	8/6/2025
Units	ug/L
SVOCs	ND

Sample ID	MW-10
SVOCs	NT

Sample ID	MW-1a
Sample Date	8/6/2025
Units	ug/L
SVOCs	ND

Sample ID	MW-9
Sample Date	8/7/2025
Units	ug/L
SVOCs	ND

Sample ID	MW-12
SVOCs	NT

Sample ID	MW-5a	AWQS - TOGS 1.1.1
Sampling Date	8/5/2025	
Units	ug/L	ug/L
1,4-Dioxane	0.61	0.35

Sample ID	MW-7
Sample Date	8/7/2025
Units	ug/L
SVOCs	ND

Sample ID	MW-6
Sample Date	8/5/2025
Units	ug/L
SVOCs	ND

Sample ID	MW-4a	AWQS - TOGS 1.1.1
Sample Date	8/7/2025	
Units	ug/L	ug/L
2-Methylnaphthalene	10.8	~
Naphthalene	13.3	10

Sample ID	MW-3a	AWQS - TOGS 1.1.1
Sample Date	8/5/2025	
Units	ug/L	ug/L
1,4-Dioxane	0.42	0.35

LEGEND:
ND = NOT DETECTED
D = RESULT IS FROM AN ANALYSIS THAT REQUIRED A DILUTION
J = ANALYTE DETECTED AT OR ABOVE THE MDL(METHOD DETECTION LIMIT) BUT BELOW THE RL(REPORTING LIMIT) - DATA IS ESTIMATED
NT = NOT A TARGET ANALYTE
AWQS - TOGS 1.1.1 = NYSDEC 6 NYCRR PART 703 AMBIENT WATER QUALITY STANDARDS - TECHNICAL AND OPERATIONAL GUIDANCE SERIES 1.1.1
INDICATES CONCENTRATION EXCEEDS AWQS

NOTE:
REFER TO FIGURE 6 FOR THE LEGEND OF MONITORING WELLS

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APPROXIMATE SCALE IN FEET

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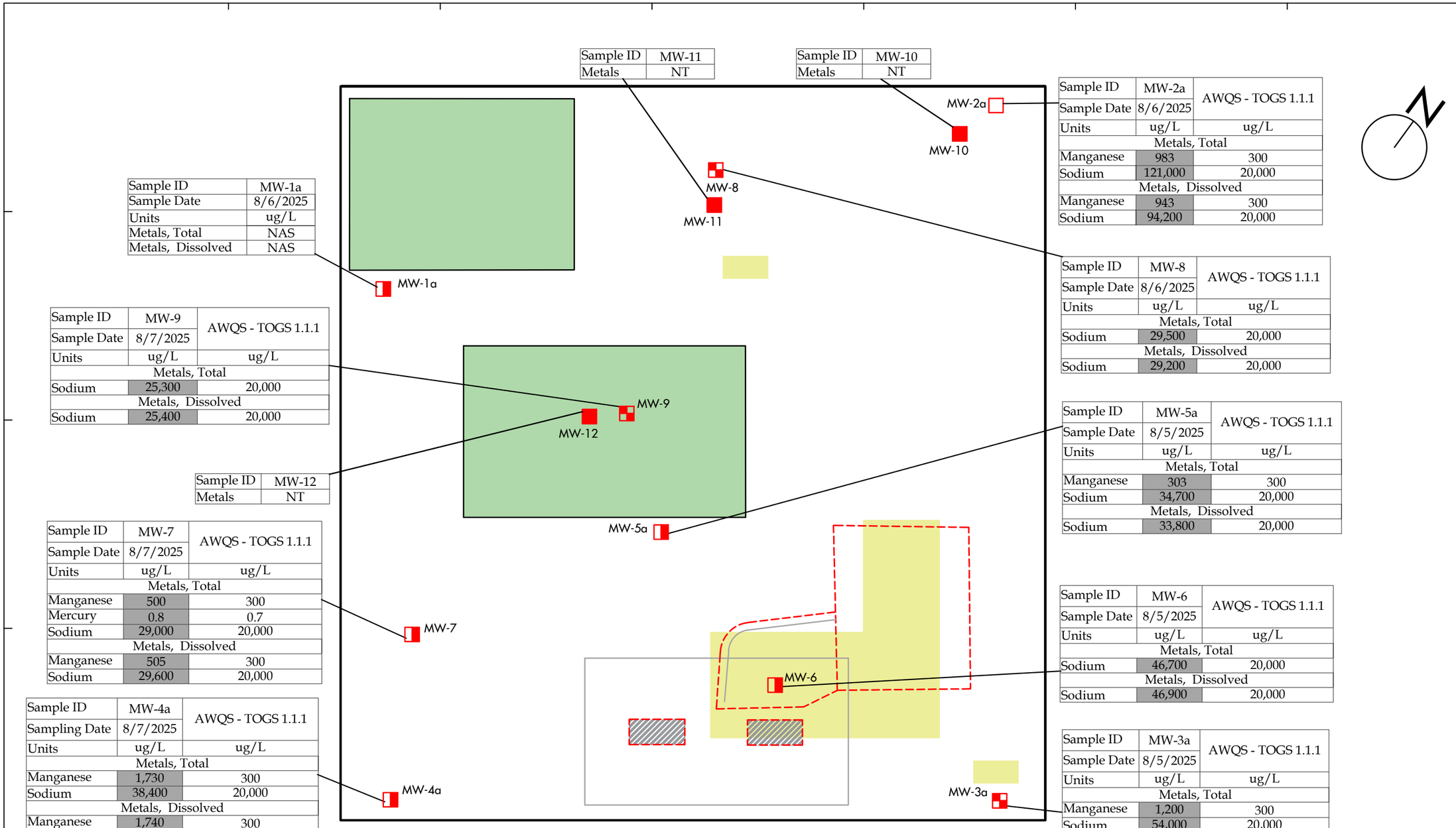
PROJECT NAME AND ADDRESS

3083 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 9B: GROUNDWATER SAMPLES CONTAMINATION SUMMARY FOR SVOCs

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



Sample ID	MW-11
Metals	NT

Sample ID	MW-10
Metals	NT

Sample ID	MW-1a
Sample Date	8/6/2025
Units	ug/L
Metals, Total	NAS
Metals, Dissolved	NAS

Sample ID	MW-2a	AWQS - TOGS 1.1.1
Sample Date	8/6/2025	
Units	ug/L	ug/L
Metals, Total		
Manganese	983	300
Sodium	121,000	20,000
Metals, Dissolved		
Manganese	943	300
Sodium	94,200	20,000

Sample ID	MW-8	AWQS - TOGS 1.1.1
Sample Date	8/6/2025	
Units	ug/L	ug/L
Metals, Total		
Sodium	29,500	20,000
Metals, Dissolved		
Sodium	29,200	20,000

Sample ID	MW-9	AWQS - TOGS 1.1.1
Sample Date	8/7/2025	
Units	ug/L	ug/L
Metals, Total		
Sodium	25,300	20,000
Metals, Dissolved		
Sodium	25,400	20,000

Sample ID	MW-5a	AWQS - TOGS 1.1.1
Sample Date	8/5/2025	
Units	ug/L	ug/L
Metals, Total		
Manganese	303	300
Sodium	34,700	20,000
Metals, Dissolved		
Sodium	33,800	20,000

Sample ID	MW-12
Metals	NT

Sample ID	MW-7	AWQS - TOGS 1.1.1
Sample Date	8/7/2025	
Units	ug/L	ug/L
Metals, Total		
Manganese	500	300
Mercury	0.8	0.7
Sodium	29,000	20,000
Metals, Dissolved		
Manganese	505	300
Sodium	29,600	20,000

Sample ID	MW-6	AWQS - TOGS 1.1.1
Sample Date	8/5/2025	
Units	ug/L	ug/L
Metals, Total		
Sodium	46,700	20,000
Metals, Dissolved		
Sodium	46,900	20,000

Sample ID	MW-4a	AWQS - TOGS 1.1.1
Sampling Date	8/7/2025	
Units	ug/L	ug/L
Metals, Total		
Manganese	1,730	300
Sodium	38,400	20,000
Metals, Dissolved		
Manganese	1,740	300
Sodium	39,200	20,000

Sample ID	MW-3a	AWQS - TOGS 1.1.1
Sample Date	8/5/2025	
Units	ug/L	ug/L
Metals, Total		
Manganese	1,200	300
Sodium	54,000	20,000
Metals, Dissolved		
Manganese	1,130	300
Sodium	53,100	20,000

LEGEND:
NAS = NONE ABOVE STANDARD
NT = NOT A TARGET ANALYTE
AWQS - TOGS 1.1.1 = NYSDEC 6 NYCRR PART 703 AMBIENT WATER QUALITY STANDARDS - TECHNICAL AND OPERATIONAL GUIDANCE SERIES 1.1.1
INDICATES CONCENTRATION EXCEEDS AWQS

NOTE:
REFER TO FIGURE 6 FOR THE LEGEND OF MONITORING WELLS

0' 40'
APPROXIMATE SCALE IN FEET

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PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 9C: GROUNDWATER SAMPLES CONTAMINATION SUMMARY FOR METALS

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

Sample ID	MW-1a	AWQS - PFOA/PFOS
Sampling Date	8/6/2025	
Units	ug/L	
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.0011 J	~
Perfluorobutanesulfonic acid (PFBS)	0.0070	~
Perfluorodecanoic acid (PFDA)	0.0011 J	~
Perfluoroheptanoic acid (PFHpA)	0.0163	~
Perfluorohexanesulfonic acid (PFHxS)	0.0036	~
Perfluorohexanoic acid (PFHxA)	0.0363	~
Perfluoro-n-butanoic acid (PFBA)	0.0225 JD	~
Perfluorononanoic acid (PFNA)	0.0035	~
Perfluorooctanesulfonic acid (PFOS)	0.0301	0.00
Perfluorooctanoic acid (PFOA)	0.0340	0.01
Perfluoropentanoic acid (PFPeA)	0.0458	~

Sample ID	MW-9	AWQS - PFOA/PFOS
Sample Date	8/7/2025	
Units	ug/L	
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.0251	~
Perfluoro-1-octanesulfonamide (FOSA)	0.0010 J	~
Perfluoro-1-pentanesulfonate (PFPeS)	0.00073 U	~
Perfluorobutanesulfonic acid (PFBS)	0.0025	~
Perfluoroheptanoic acid (PFHpA)	0.0051	~
Perfluorohexanesulfonic acid (PFHxS)	0.0014 J	~
Perfluorohexanoic acid (PFHxA)	0.0061	~
Perfluorononanoic acid (PFNA)	0.0016 J	~
Perfluorooctanesulfonic acid (PFOS)	0.0168	0.00
Perfluorooctanoic acid (PFOA)	0.0124	0.01
Perfluoropentanoic acid (PFPeA)	0.0064	~

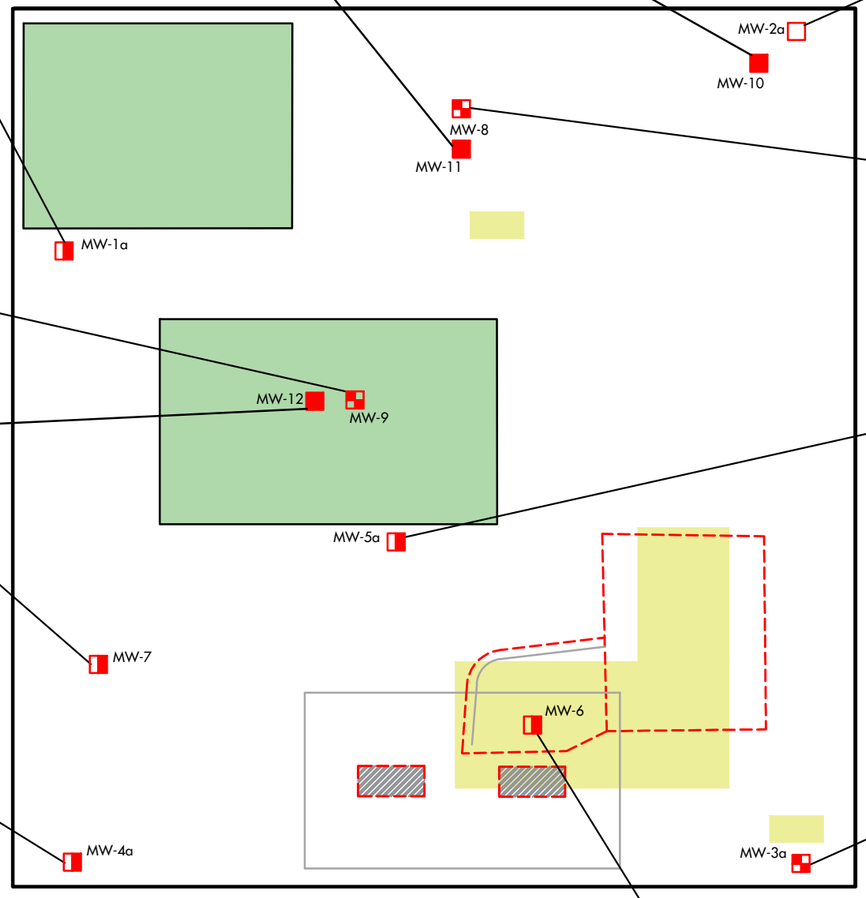
Sample ID	MW-12
Polyfluoroalkyl substances (PFAS)	NT

Sample ID	MW-7	AWQS - PFOA/PFOS
Sampling Date	8/7/2025	
Units	ug/L	
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.0005 J	~
Perfluorobutanesulfonic acid (PFBS)	0.0055	~
Perfluorodecanoic acid (PFDA)	0.0009 J	~
Perfluoroheptanoic acid (PFHpA)	0.0079	~
Perfluorohexanesulfonic acid (PFHxS)	0.0024	~
Perfluorohexanoic acid (PFHxA)	0.0242	~
Perfluoro-n-butanoic acid (PFBA)	0.0080	~
Perfluorononanoic acid (PFNA)	0.0027	~
Perfluorooctanesulfonic acid (PFOS)	0.0274	0.00
Perfluorooctanoic acid (PFOA)	0.0223	0.01
Perfluoropentanoic acid (PFPeA)	0.0257	~

Sample ID	MW-4a	AWQS - PFOA/PFOS
Sampling Date	8/7/2025	
Units	ug/L	
Perfluorobutanesulfonic acid (PFBS)	0.0051	~
Perfluorodecanoic acid (PFDA)	0.001 J	~
Perfluoroheptanoic acid (PFHpA)	0.0109	~
Perfluorohexanesulfonic acid (PFHxS)	0.0027	~
Perfluorohexanoic acid (PFHxA)	0.0516	~
Perfluoro-n-butanoic acid (PFBA)	0.8080 D	~
Perfluorononanoic acid (PFNA)	0.0031	~
Perfluorooctanesulfonic acid (PFOS)	0.0369	0.00
Perfluorooctanoic acid (PFOA)	0.0226	0.01
Perfluoropentanoic acid (PFPeA)	0.0531	~

Sample ID	MW-11
Polyfluoroalkyl substances (PFAS)	NT

Sample ID	MW-10
Polyfluoroalkyl substances (PFAS)	NT



WEBSTER AVENUE

Sample ID	MW-2a	AWQS - PFOA/PFOS
Sampling Date	8/6/2025	
Units	ug/L	
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	0.0030 J	~
Perfluoro-1-octanesulfonamide (FOSA)	0.0014 J	~
Perfluorobutanesulfonic acid (PFBS)	0.0054	~
Perfluorodecanoic acid (PFDA)	0.0019 J	~
Perfluoroheptanoic acid (PFHpA)	0.0074	~
Perfluorohexanesulfonic acid (PFHxS)	0.0024	~
Perfluorohexanoic acid (PFHxA)	0.0193	~
Perfluorononanoic acid (PFNA)	0.0028	~
Perfluorooctanesulfonic acid (PFOS)	0.0401	0.00
Perfluorooctanoic acid (PFOA)	0.0152	0.01
Perfluoropentanoic acid (PFPeA)	0.0231	~

Sample ID	MW-8	AWQS - PFOA/PFOS
Sampling Date	8/6/2025	
Units	ug/L	
Perfluoro-1-octanesulfonamide (FOSA)	0.0007 J	~
Perfluorobutanesulfonic acid (PFBS)	0.0035	~
Perfluorodecanoic acid (PFDA)	0.0007 J	~
Perfluoroheptanoic acid (PFHpA)	0.0038	~
Perfluorohexanesulfonic acid (PFHxS)	0.0018	~
Perfluorohexanoic acid (PFHxA)	0.0097	~
Perfluorononanoic acid (PFNA)	0.0018 J	~
Perfluorooctanesulfonic acid (PFOS)	0.0119	0.00
Perfluorooctanoic acid (PFOA)	0.0104	0.01
Perfluoropentanoic acid (PFPeA)	0.0164	~

Sample ID	MW-5a	AWQS - PFOA/PFOS
Sampling Date	8/5/2025	
Units	ug/L	
N-EtFOSE	0.0070 J	~
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.0007 J	~
Perfluorobutanesulfonic acid (PFBS)	0.0035	~
Perfluorodecanoic acid (PFDA)	0.0009 J	~
Perfluoroheptanoic acid (PFHpA)	0.0044	~
Perfluorohexanesulfonic acid (PFHxS)	0.0027	~
Perfluorohexanoic acid (PFHxA)	0.0212	~
Perfluoro-n-butanoic acid (PFBA)	0.0112	~
Perfluorononanoic acid (PFNA)	0.0027	~
Perfluorooctanesulfonic acid (PFOS)	0.0289	0.00
Perfluorooctanoic acid (PFOA)	0.0151	0.01
Perfluoropentanoic acid (PFPeA)	0.0248	~

Sample ID	MW-3a	AWQS - PFOA/PFOS
Sampling Date	8/5/2025	
Units	ug/L	
Perfluoro-1-heptanesulfonic acid (PFHpS)	0.0010 J	~
Perfluoro-1-octanesulfonamide (FOSA)	0.0009 J	~
Perfluoro-1-pentanesulfonate (PFPeS)	0.0008 J	~
Perfluorobutanesulfonic acid (PFBS)	0.0052	~
Perfluorodecanoic acid (PFDA)	0.0012 J	~
Perfluoroheptanoic acid (PFHpA)	0.0129	~
Perfluorohexanesulfonic acid (PFHxS)	0.0044	~
Perfluorohexanoic acid (PFHxA)	0.1570	~
Perfluorononanoic acid (PFNA)	0.0029	~
Perfluorooctanesulfonic acid (PFOS)	0.0353	0.00
Perfluorooctanoic acid (PFOA)	0.0245	0.01
Perfluoropentanoic acid (PFPeA)	0.1550	~

Sample ID	MW-6	AWQS - PFOA/PFOS
Sampling Date	8/5/2025	
Units	ug/L	
Perfluoro-1-decanesulfonic acid (PFDS)	0.0008 J	~
Perfluoro-1-octanesulfonamide (FOSA)	0.0006 J	~
Perfluorobutanesulfonic acid (PFBS)	0.0044	~
Perfluorodecanoic acid (PFDA)	0.0012 J	~
Perfluoroheptanoic acid (PFHpA)	0.0072	~
Perfluorohexanesulfonic acid (PFHxS)	0.0030	~
Perfluorohexanoic acid (PFHxA)	0.0614	~
Perfluoro-n-butanoic acid (PFBA)	0.0214	~
Perfluorononanoic acid (PFNA)	0.0044	~
Perfluorooctanesulfonic acid (PFOS)	0.0259	0.00
Perfluorooctanoic acid (PFOA)	0.0209	0.01
Perfluoropentanoic acid (PFPeA)	0.0777	~

LEGEND:
ND NOT DETECTED
NT NOT A TARGET ANALYTE
INDICATES VALUE EXCEEDS AWQS - PFOA/PFOS
AWQS - PFOA/PFOS = NYSDEC AMBIENT WATER QUALITY GUIDANCE VALUES FOR PFOA AND PFOS - APRIL 2023

NOTE:
REFER TO FIGURE 6 FOR THE LEGEND OF MONITORING WELLS

0' 40'
APPROXIMATE SCALE IN FEET

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PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 9D: GROUNDWATER SAMPLES CONTAMINATION SUMMARY FOR PFAS

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

Sample ID	SV-1	SV-1R-I	SV-1R-D
Sampling Date	7/30/2024	7/24/2025	7/24/2025
Sampel Depth	12 FT	7 FT	14 FT
Units	ug/m3	ug/m3	ug/m3
1,1,1-Trichloroethane	1.6 D	NT	NT
1,2,4-Trimethylbenzene	9 D	5.7 D	6.5 D
1,3,5-Trimethylbenzene	3.3 D	ND	ND
2,2,4-Trimethylpentane	0.67 D	4.6 D	5.1 D
Benzene	1.2 D	ND	4.2 D
Ethyl Benzene	2.6 D	4.7 D	3.8 D
n-Heptane	0.81 D	ND	ND
o-Xylene	7 D	13 D	7.3 D
p- & m- Xylenes	13 D	20 D	14 D
Toluene	4.5 D	21 D	16 D
p-Ethyltoluene	8.7 D	NT	NT
Tetrachloroethylene	260 D	110 D	89 D
Bromodichloromethane	1.2	ND	ND
Carbon disulfide	0.56	9.7 D	13 D
2-Butanone	5.6 D	130 J	110 J
2-Hexanone	1.6 D	ND	ND
Acetone	180 BD	410 D	380 D
Acrylonitrile	ND	ND	79 J
Chloromethane	1.4 D	ND	3.3 D
Dichlorodifluoromethane	2.6 D	NT	NT
Ethyl acetate	NT	160 J	130 J
Isopropanol	3.6 D	13 J	11 J
Propylene	1.2 D	ND	5.9 D
Styrene	0.84 D	ND	ND
Tetrahydrofuran	1.2 D	ND	ND
Trichlorofluoromethane (Freon 11)	1.8 D	ND	ND

Sample ID	SV-7-I	SV-7-I-DUP	SV-7-D
Sampling Date	7/24/2025	7/24/2025	7/24/2025
Sampel Depth	5 FT	10 FT	10 FT
Units	ug/m3	ug/m3	ug/m3
1,2,4-Trimethylbenzene	4.3 D	4.7 D	ND
1,3,5-Trimethylbenzene	1.9 D	2 D	ND
2,2,4-Trimethylpentane	3.4 D	4.3 D	4.1 D
Benzene	1.1 D	2.1 D	3.1 D
Ethyl Benzene	2.7 D	3.4 D	ND
n-Heptane	2 D	2.6 D	ND
n-Hexane	2.3 D	3.3 D	ND
o-Xylene	5.1 D	5.8 D	4.2 D
p- & m- Xylenes	10 D	12 D	8.8 D
Toluene	11 D	15 D	12 D
Tetrachloroethylene	41 D	43 D	28 D
Carbon disulfide	8.4 D	11 D	22 D
2-Butanone	44 J	55 J	140 J
2-Hexanone	2.9 D	3.3 D	ND
Acetone	260 D	310 D	620 D
Dichlorodifluoromethane	ND	2.4 D	ND
Ethyl acetate	54 J	67 J	170 J
Isopropanol	6.5 D	8 D	14 J
Propylene	4.1 D	ND	280 D

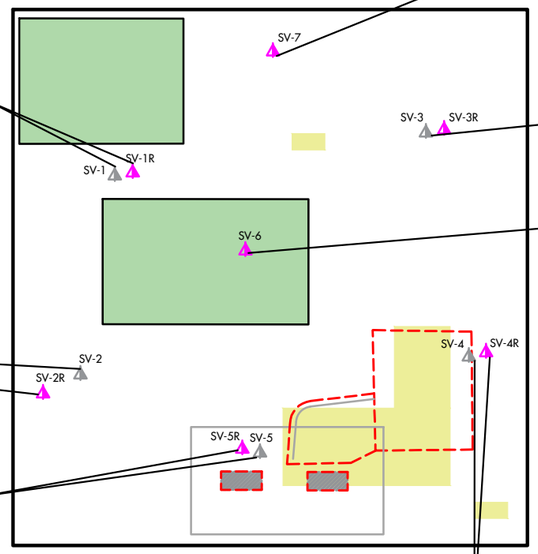
Sample ID	SV-3	SV-3R
Sampling Date	7/30/2024	7/24/2025
Sampel Depth	12 FT	7 FT
Units	ug/m3	ug/m3
1,2,4-Trimethylbenzene	8.6 D	4.7 D
1,3,5-Trimethylbenzene	3.3 D	2.7 D
2,2,4-Trimethylpentane	0.99 D	4 D
Benzene	0.62 D	2 D
Ethyl Benzene	6.7 D	3.2 D
n-Heptane	0.87 D	3.3 D
n-Hexane	ND	3 D
o-Xylene	15 D	6.6 D
p- & m- Xylenes	30 D	12 D
Toluene	4.8 D	13 D
p-Ethyltoluene	7.5 D	NT
Chloroform	ND	1.8 U
Tetrachloroethylene	160 D	9.3 D
Carbon disulfide	7.5 D	14 D
2-Butanone	8.2 D	54 J
2-Hexanone	2.5 D	9.4 D
4-Methyl-2-pentanone	1.9 D	ND
Acetone	190 BD	370 D
Acrylonitrile	ND	40 J
Chloromethane	0.73 D	1.1 D
Cyclohexane	NT	2.9 D
Dichlorodifluoromethane	3 D	NT
Ethyl acetate	NT	67 J
Isopropanol	3 D	6.9 D
Propylene	1.5 D	7.9 D
Styrene	0.75 D	ND
Tetrahydrofuran	2.2 D	ND
Trichlorofluoromethane (Freon 11)	1.9 D	ND

Sample ID	SV-2A	SV-2B	SV-2R-I	SV-2R-D
Sampling Date	7/30/2024	7/30/2024	7/24/2025	7/24/2025
Sampel Depth	6 FT	6 FT	6.5 FT	13 FT
Units	ug/m3	ug/m3	ug/m3	ug/m3
1,2,4-Trimethylbenzene	8.7 D	6.9 D	6 D	6.1 D
1,3,5-Trimethylbenzene	3.1 D	2.5 D	ND	ND
2,2,4-Trimethylpentane	1.1 D	ND	3.5 D	5.8 D
Benzene	1.7 D	1.8 D	ND	ND
Ethyl Benzene	3.1 D	2.1 D	ND	ND
n-Heptane	1.5 D	ND	ND	ND
n-Hexane	1.7 D	ND	ND	ND
o-Xylene	8.3 D	6.4 D	6.9 D	6.3 D
p- & m- Xylenes	16 D	10 D	12 D	11 D
Toluene	6.2 D	4.5 D	9.5 D	13 D
p-Ethyltoluene	8.1 D	5.5 D	NT	NT
Chloroform	590 D	23 D	340 D	310 D
cis-1,2-Dichloroethylene	0.6 D	ND	NT	NT
Tetrachloroethylene	1100 D	970 D	880 D	300 D
Trichloroethylene	0.61 D	ND	ND	3.1 D
Bromodichloromethane	14 D	ND	7.5 D	7.1 D
Carbon disulfide	3.4 D	1.7 D	4.7 D	ND
2-Butanone	9.5 D	6.7 D	140 J	140 J
Acetone	200 BD	160 BD	390 D	470 D
Acrylonitrile	10 D	10 D	100 J	ND
Chloromethane	0.78 D	ND	ND	ND
Dichlorodifluoromethane	3 D	2.7 D	NT	NT
Ethyl acetate	NT	NT	170 J	170 J
Isopropanol	2.7 D	3.3 D	14 J	14 J
Propylene	3.2 D	2.7 D	5.5 D	ND
Tetrahydrofuran	3.3 D	ND	ND	ND

Sample ID	SV-5	SV-5R-I	SV-5R-D
Sampling Date	7/30/2024	7/24/2025	7/24/2025
Sampel Depth	12 FT	8.5 FT	17 FT
Units	ug/m3	ug/m3	ug/m3
1,2,4-Trimethylbenzene	11 D	4.8 D	4.8 D
1,3,5-Trimethylbenzene	3.9 D	ND	1.9 D
2,2,4-Trimethylpentane	1.2 D	7.5 D	4.2 D
Benzene	1.2 D	ND	1.5 D
Ethyl Benzene	3.8 D	3.9 D	4.1 D
n-Heptane	ND	ND	2.4 D
n-Hexane	ND	ND	1.5 D
o-Xylene	10 D	7.7 D	7.3 D
p- & m- Xylenes	18 D	16 D	15 D
Toluene	7.7 D	13 D	15 D
p-Ethyltoluene	9.2 D	NT	NT
Chloroform	ND	11 D	43 D
Tetrachloroethylene	890 D	120 D	150 D
Trichloroethylene	1.3 D	ND	2.3 D
Carbon disulfide	1.6 D	5 D	7.5 D
2-Butanone	7.4 D	130 J	58 J
Acetone	90 BD	500 D	330 D
Acrylonitrile	ND	ND	43 J
Chloromethane	1 D	ND	ND
Dichlorodifluoromethane	2.8 D	NT	NT
Ethyl acetate	NT	160 J	71 J
Isopropanol	1.7 D	13 J	7.4 D
Propylene	4.4 D	ND	5.8 D
Tetrahydrofuran	2.3 D	ND	ND
Trichlorofluoromethane (Freon 11)	1.9 U	ND	ND

Sample ID	SV-6
Sampling Date	7/24/2025
Sampel Depth	8 FT
Units	ug/m3
1,2,4-Trimethylbenzene	7.6 D
1,3,5-Trimethylbenzene	3.4 D
2,2,4-Trimethylpentane	4 D
Benzene	1 D
Ethyl Benzene	4 D
n-Heptane	1.9 D
n-Hexane	1.2 D
o-Xylene	8.3 D
p- & m- Xylenes	16 D
Toluene	12 D
Carbon tetrachloride	0.33 D
Chloroform	21 D
Tetrachloroethylene	350 D
Carbon disulfide	4.4 D
2-Butanone	26 J
2-Hexanone	2.5 D
4-Methyl-2-pentanone	5.8 D
Acetone	200 D
Acrylonitrile	19 J
Cyclohexane	0.73 D
Ethyl acetate	32 J
Isopropanol	5.3 D
Propylene	24 D
Styrene	0.9 D
Trichlorofluoromethane (Freon 11)	1.3 D

Sample ID	SV-4A	SV-4B	SV-4R-I	SV-4R-D
Sampling Date	7/30/2024	7/30/2024	7/24/2025	7/24/2025
Sampel Depth	6 FT	12 FT	7.5 FT	13 FT
Units	ug/m3	ug/m3	ug/m3	ug/m3
1,2,4-Trimethylbenzene	6.7 D	8.7 D	4.8 D	120 D
1,3,5-Trimethylbenzene	ND	3 D	2.4 D	200 D
2,2,4-Trimethylpentane	1.5 J	0.52 D	250 D	5100 D
Benzene	ND	0.51 D	ND	ND
Ethyl Benzene	2.8 D	1.6 D	2.9 D	180 D
n-Heptane	ND	ND	12 D	620 D
n-Hexane	ND	ND	5 D	81 D
o-Xylene	7.6 D	5.2 D	6.8 D	1200 D
p- & m- Xylenes	13 D	8.2 D	13 D	2400 D
Toluene	6.1 D	2.5 D	8.4 D	18 D
p-Ethyltoluene	5.7 D	6.5 D	NT	NT
Tetrachloroethylene	150 D	86 D	4.8 D	ND
Carbon disulfide	ND	0.5 D	1.2 D	ND
2-Butanone	11 D	3 D	55 J	250 J
2-Hexanone	ND	ND	3.8 D	ND
Acetone	300 BD	45 BD	240 D	490 D
Cyclohexane	NT	NT	5 D	110 D
Dichlorodifluoromethane	ND	2.7 D	NT	NT
Ethyl acetate	NT	NT	67 J	ND
Isopropanol	4.1 D	1 D	5.7 D	25 J
Propylene	1.7 D	3.9 D	3.7 D	5.5 D
Styrene	ND	ND	ND	36 D
Tetrahydrofuran	ND	1.6 D	ND	ND
Trichlorofluoromethane (Freon 11)	ND	1.6 D	ND	ND



WEBSTER AVENUE

LEGEND:
D = RESULT IS FROM AN ANALYSIS THAT REQUIRED A DILUTION
J = ANALYTE DETECTED AT OR ABOVE THE MDL (METHOD DETECTION LIMIT) BUT BELOW THE RL (REPORTING LIMIT) - DATA IS ESTIMATED
FT = DEPTH IN FEET BELOW EXISTING GRADE SURFACE (bgs)

NOTE:
REFER TO FIGURE 6 FOR THE LEGEND OF SOIL VAPOR PROBES

0' 40'
APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

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HydroTech

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

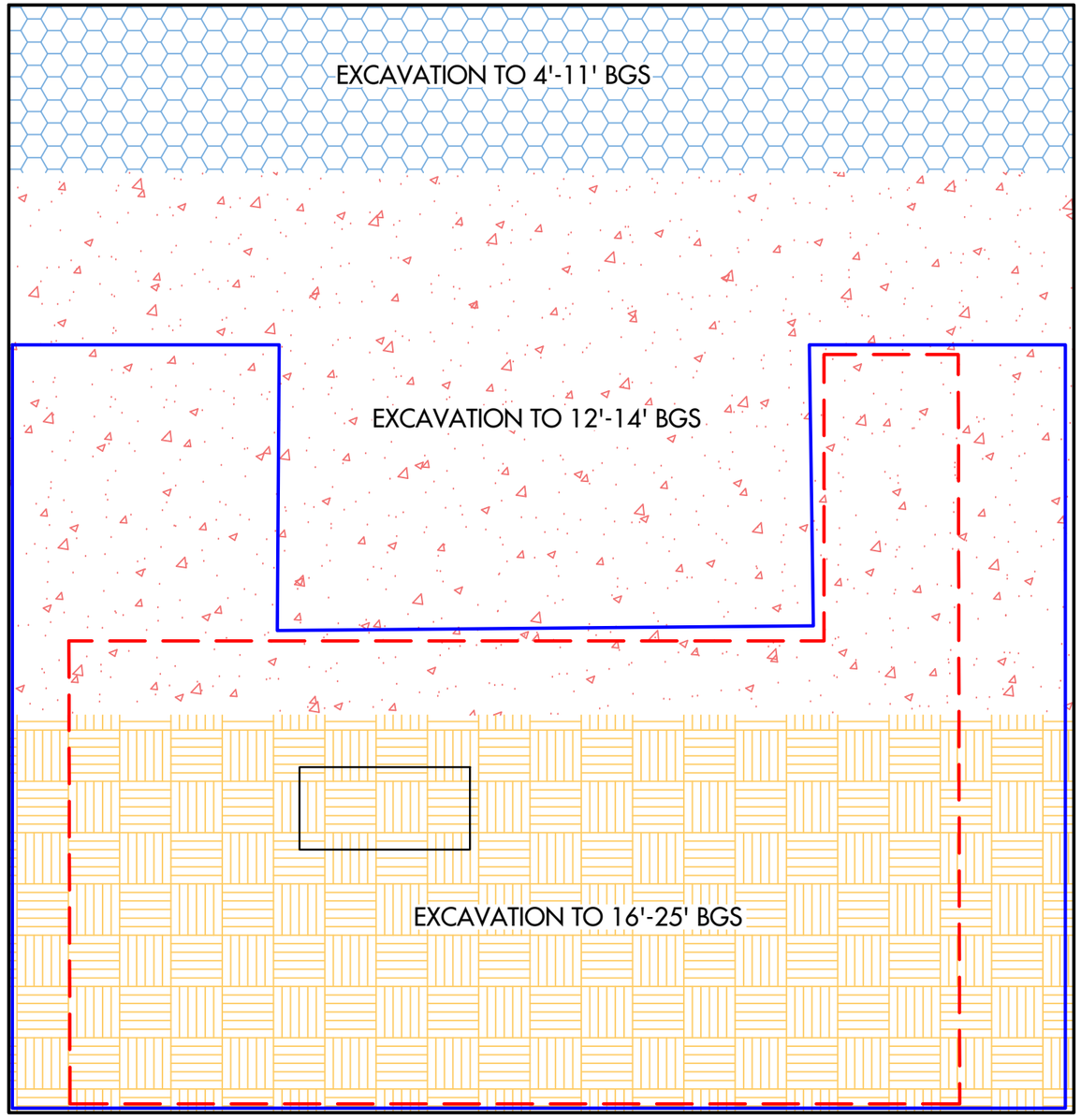
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 10: SOIL VAPOR SAMPLES CONTAMINATION SUMMARY

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



WEBSTER AVENUE

LEGEND:

- PROPERTY BOUNDARY
- PROPOSED BUILDING OUTLINE
- PROPOSED PARTIAL BASEMENT LAYOUT
- PROPOSED ELEVATOR PIT

NOTE:

1. EXCAVATION FOR THE REMOVAL OF SOIL EXCEEDING UUSCOs TO DIFFERENT DEPTHS ACROSS THE SITE, AS NOTED ON PLAN
2. UUSCO = NYSDEC PART 375 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES
3. BGS = BELOW GRADE SURFACE

0 30
APPROXIMATE SCALE IN FEET

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PROJECT NAME AND ADDRESS

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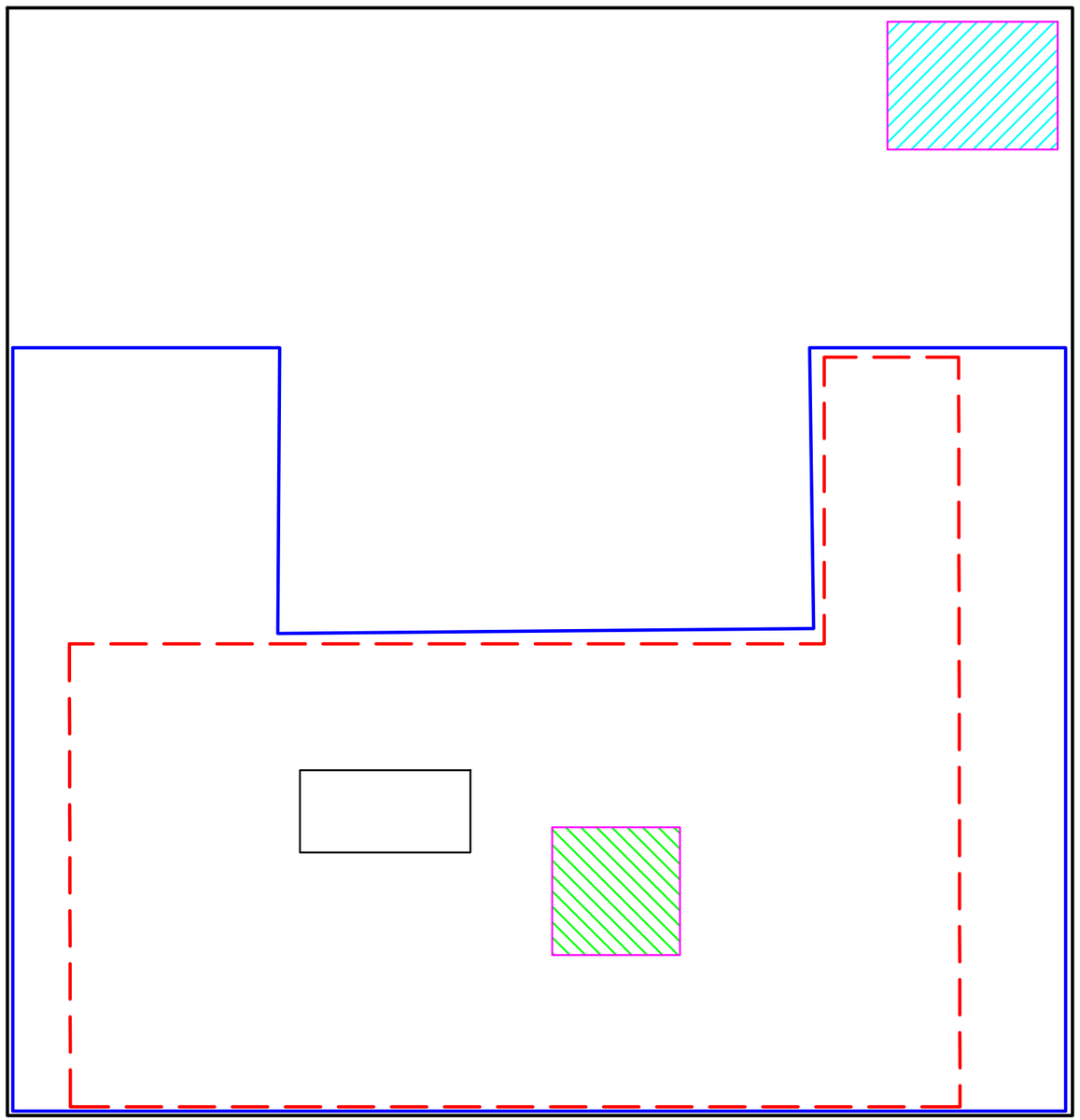
PROJECT FIGURE

FIGURE 11: MAP OF EXCAVATION FOR ALTERNATIVE 1- TRACK 1

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



WEBSTER AVENUE

LEGEND:

- PROPERTY BOUNDARY
- PROPOSED BUILDING OUTLINE
- PROPOSED PARTIAL BASEMENT LAYOUT
- PROPOSED ELEVATOR PIT
- EXCAVATION TO ATLEAST 7 FT BGS FOR THE REMOVAL OF SVOCs AND METAL HOTSPOT EXCEEDING RRSCOs
- EXCAVATION TO ATLEAST 18 FT BGS FOR THE REMOVAL OF VOCs HOTSPOT EXCEEDING RRSCOs AND PGWSCOs

NOTE:

1. TRACK 2 EXCAVATION FOR THE REMOVAL OF SOIL EXCEEDING RRSCOs AND PGWSCOs
2. RRSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES- RESTRICTED RESIDENTIAL
3. PGWSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES - PROTECTION OF GROUNDWATER

0 30

APPROXIMATE SCALE IN FEET

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PROJECT NAME AND ADDRESS

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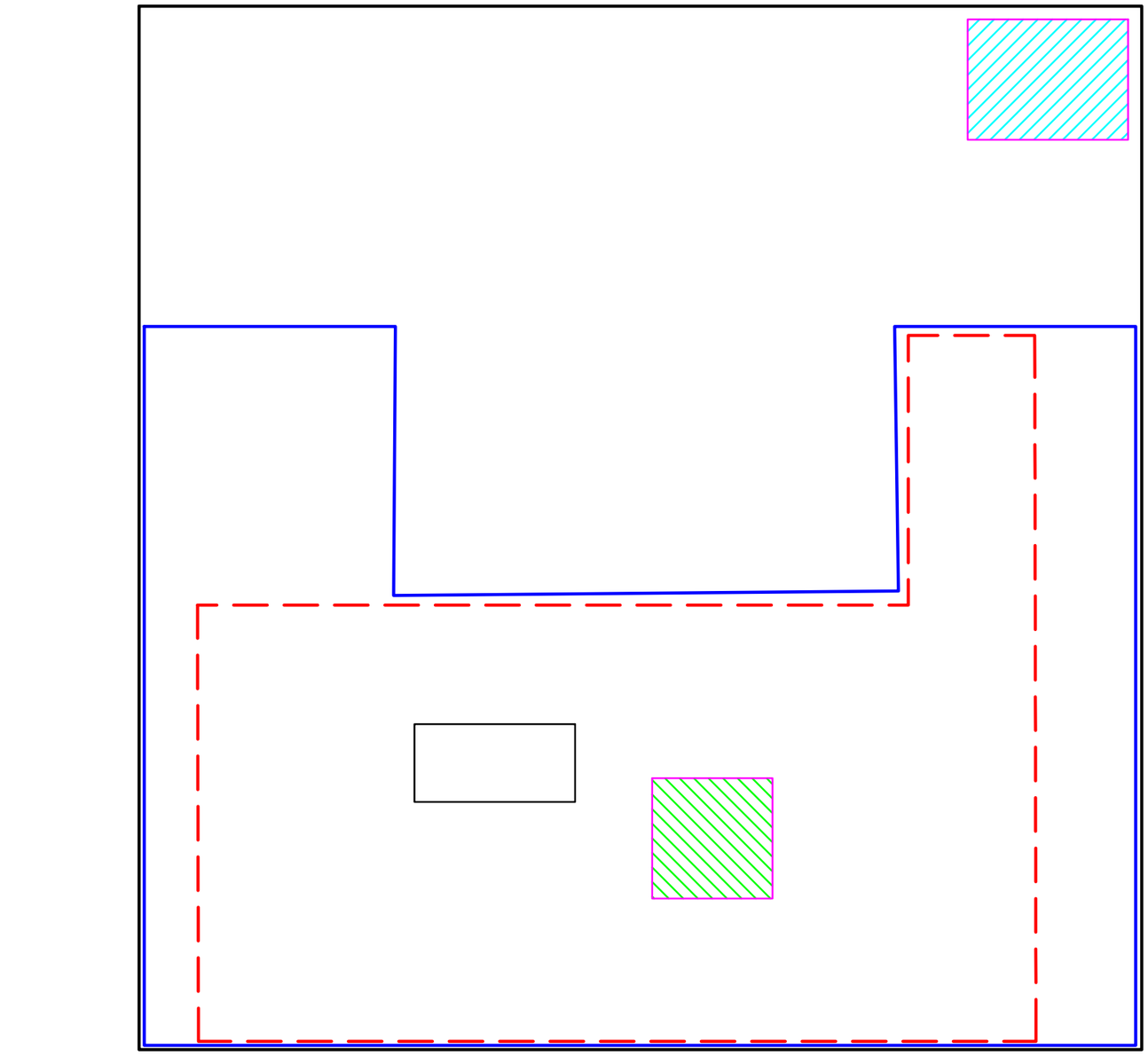
PROJECT FIGURE

FIGURE 12: MAP OF EXCAVATION FOR ALTERNATIVE 2- TRACK 2

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



WEBSTER AVENUE

LEGEND:

- PROPERTY BOUNDARY
- PROPOSED BUILDING OUTLINE
- PROPOSED PARTIAL BASEMENT LAYOUT
- PROPOSED ELEVATOR PIT
- EXCAVATION TO 4 FT BGS FOR THE REMOVAL OF SVOCs AND METAL HOTSPOT EXCEEDING RRSCOs
- EXCAVATION TO 14 FT BGS FOR THE REMOVAL OF VOCs HOTSPOT EXCEEDING RRSCOs

NOTE:

1. TRACK 2 EXCAVATION FOR THE REMOVAL OF SOIL EXCEEDING RRSCOs AND PGWSCOs
2. RRSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES- RESTRICTED RESIDENTIAL
3. PGWSCO = NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES - PROTECTION OF GROUNDWATER

0 30

APPROXIMATE SCALE IN FEET

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PROJECT NAME AND ADDRESS

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PROJECT FIGURE

FIGURE 13: MAP OF EXCAVATION FOR ALTERNATIVE 3- TRACK 4

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

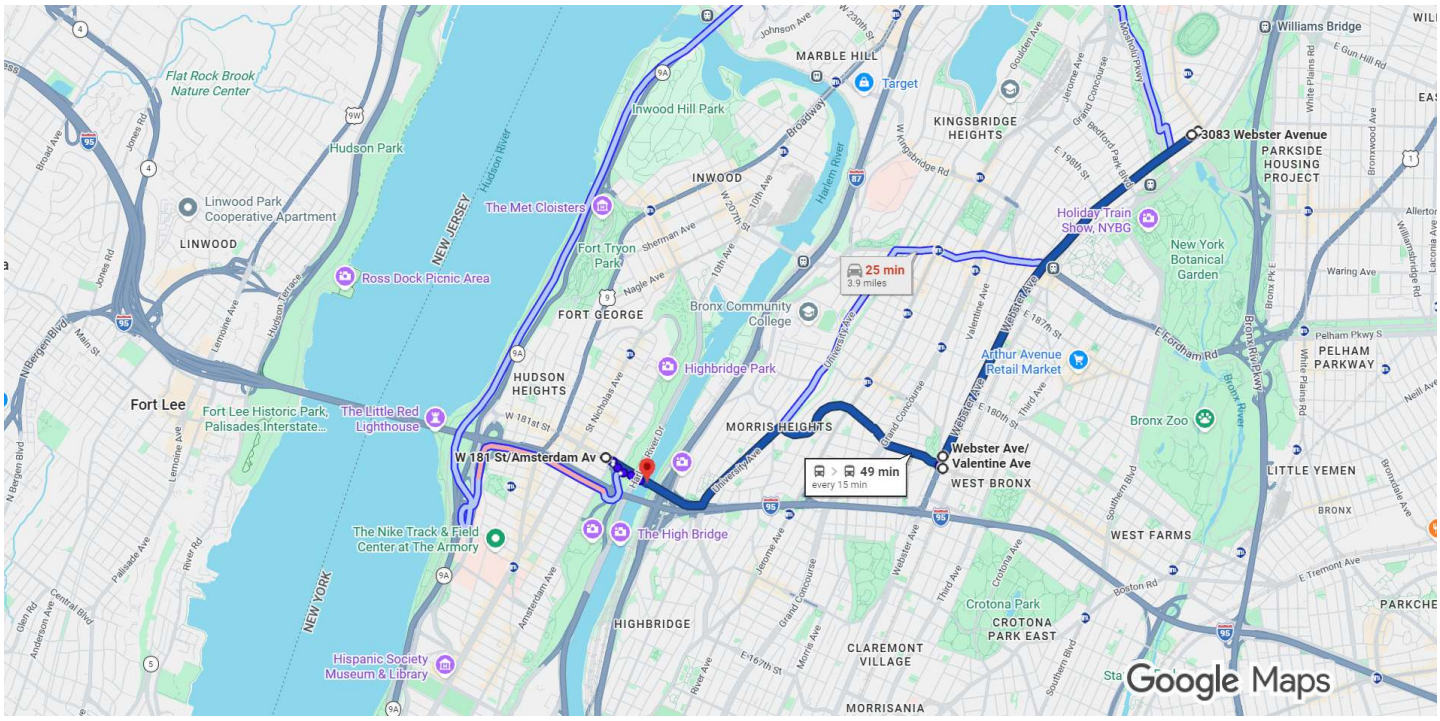
Figure 14

Truck Transport Route

Google Maps

3083 Webster Ave, Bronx, NY 10467 to Washington Brg, New York, NY

4:27 PM - 5:16 PM (49 min)



Imagery ©2026 , Map data ©2026 Google 2000 ft

via Dr M.L.K. Jr Blvd/University Ave — 25 min, 3.9 miles

Fastest route now, avoids slowdown before the Washington Bridge.

via NY-9A S — 25 min, 10.0 miles

Avoids slowdown before the Washington Bridge

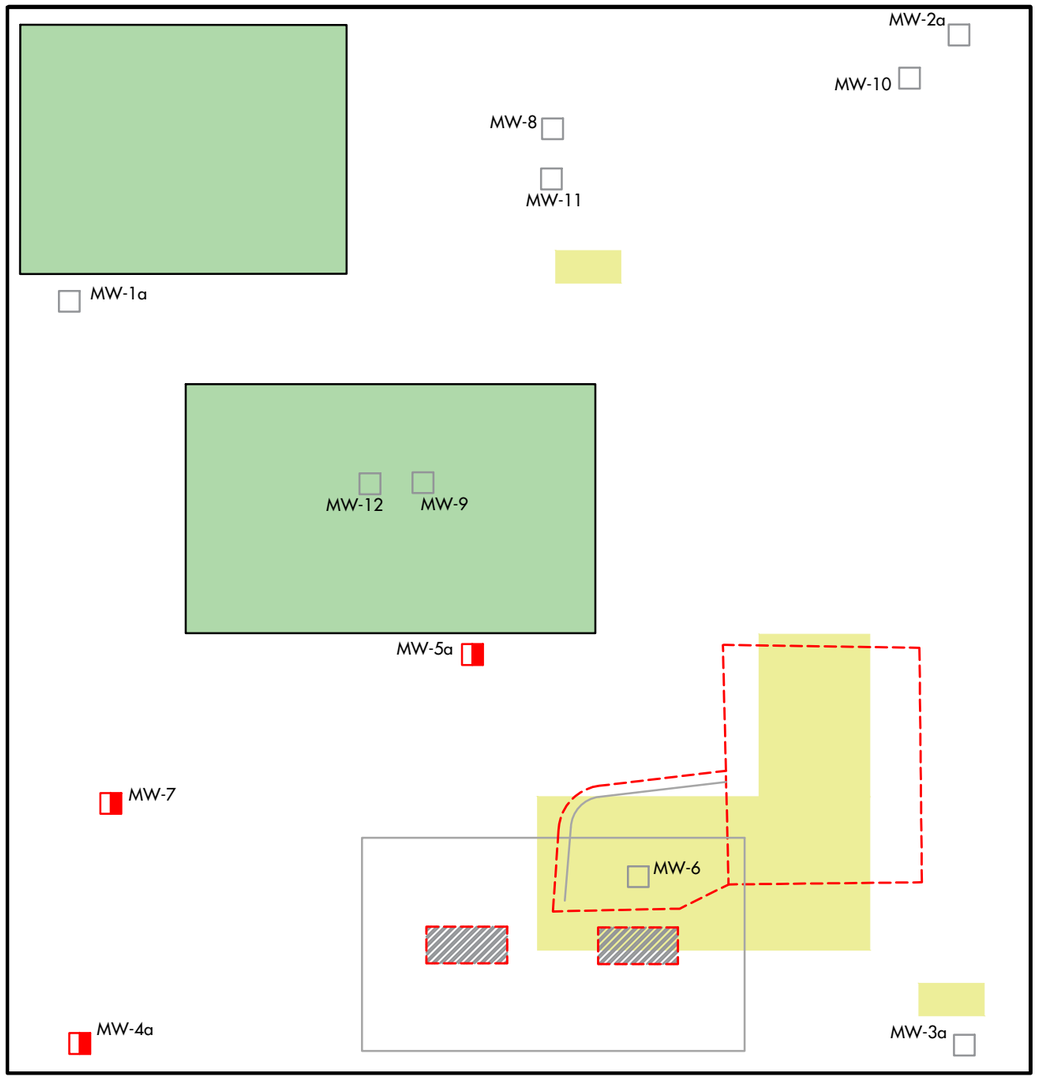
4:27 PM—5:16 PM — 49 min

Bx41 › Bx36 ›

4:28 PM from Webster Avenue & E 204 Street

$3.00 10 min every 15 min

Explore Washington Brg



WEBSTER AVENUE

LEGEND:

- MONITORING WELLS TO BE PRESERVED AND USED IN POST-REMEDIATION GROUNDWATER MONITORING PROGRAM
- MONITORING WELLS TO BE DECOMMISSIONED PRIOR TO SITE REMEDIATION

0' 40'

APPROXIMATE SCALE IN FEET

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BASE DRAWING PREPARED BY

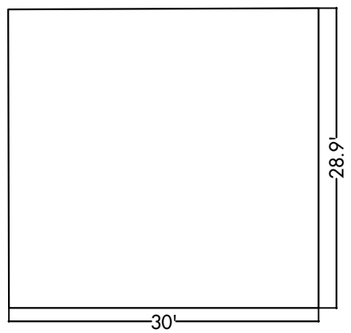
PROJECT NAME AND ADDRESS

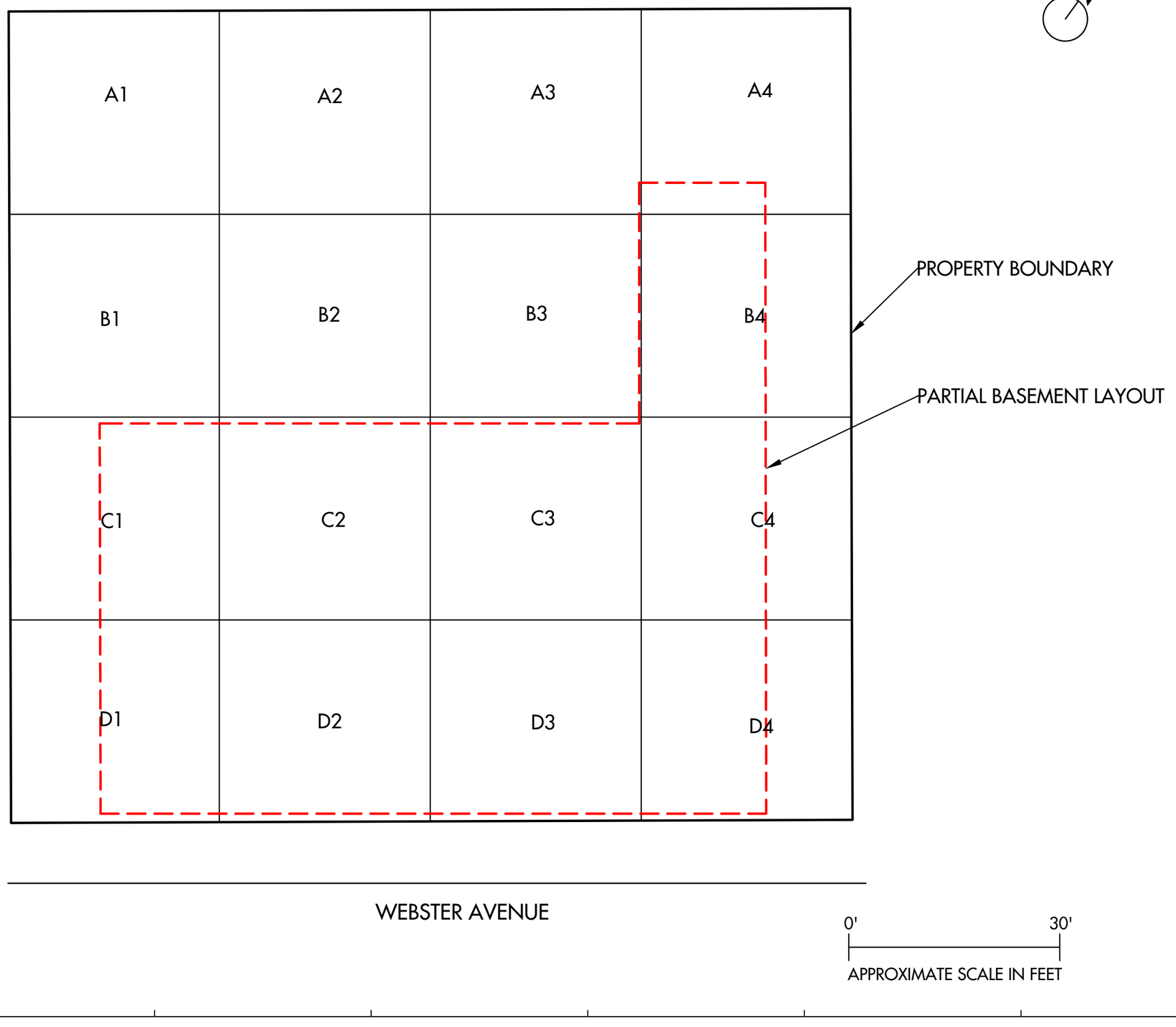
3083 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 15: MAP OF MONITORING WELLS TO BE PRESERVED OR DECOMMISSIONED

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.





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PROJECT NAME AND ADDRESS

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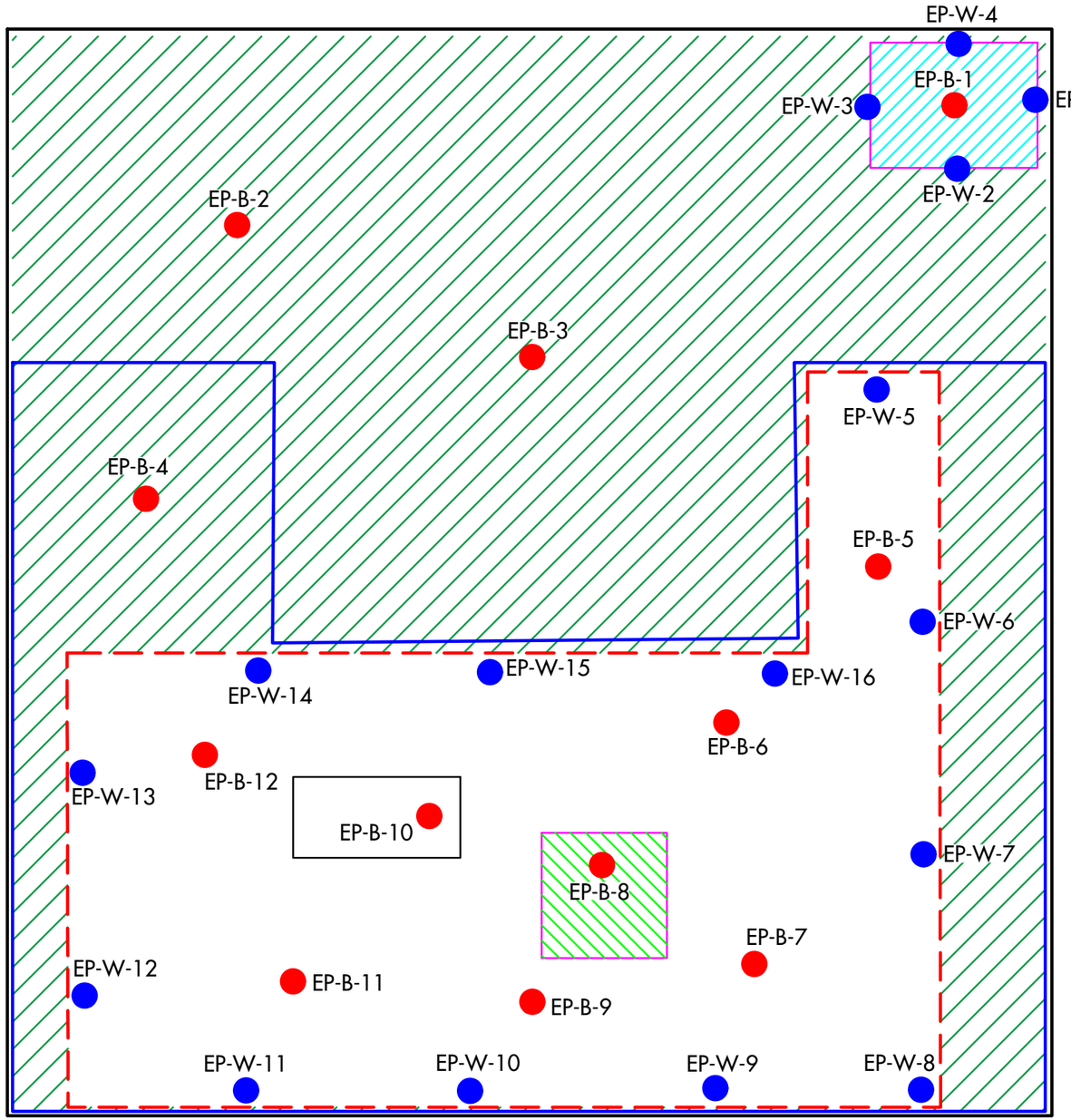
PROJECT FIGURE

FIGURE 16: ALPHA-NUMERIC SITE GRID MAP

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



WEBSTER AVENUE

LEGEND:

- PROPERTY BOUNDARY
- BUILDING OUTLINE
- PARTIAL BASEMENT LAYOUT
- HOTSPOT OF VOCs EXCEEDING PGWSCOs
- HOTSPOT OF SVOCs AND METALS EXCEEDING RRSCOs
- ELEVATOR PIT
- SIDEWALL END-POINT SAMPLE (EP-W-)
- BOTTOM END-POINT SAMPLE (EP-B-)

RRSCO - NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES- RESTRICTED RESIDENTIAL

PGWSCO - NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES- PROTECTION OF GROUNDWATER

0 30

APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

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BASE DRAWING PREPARED BY

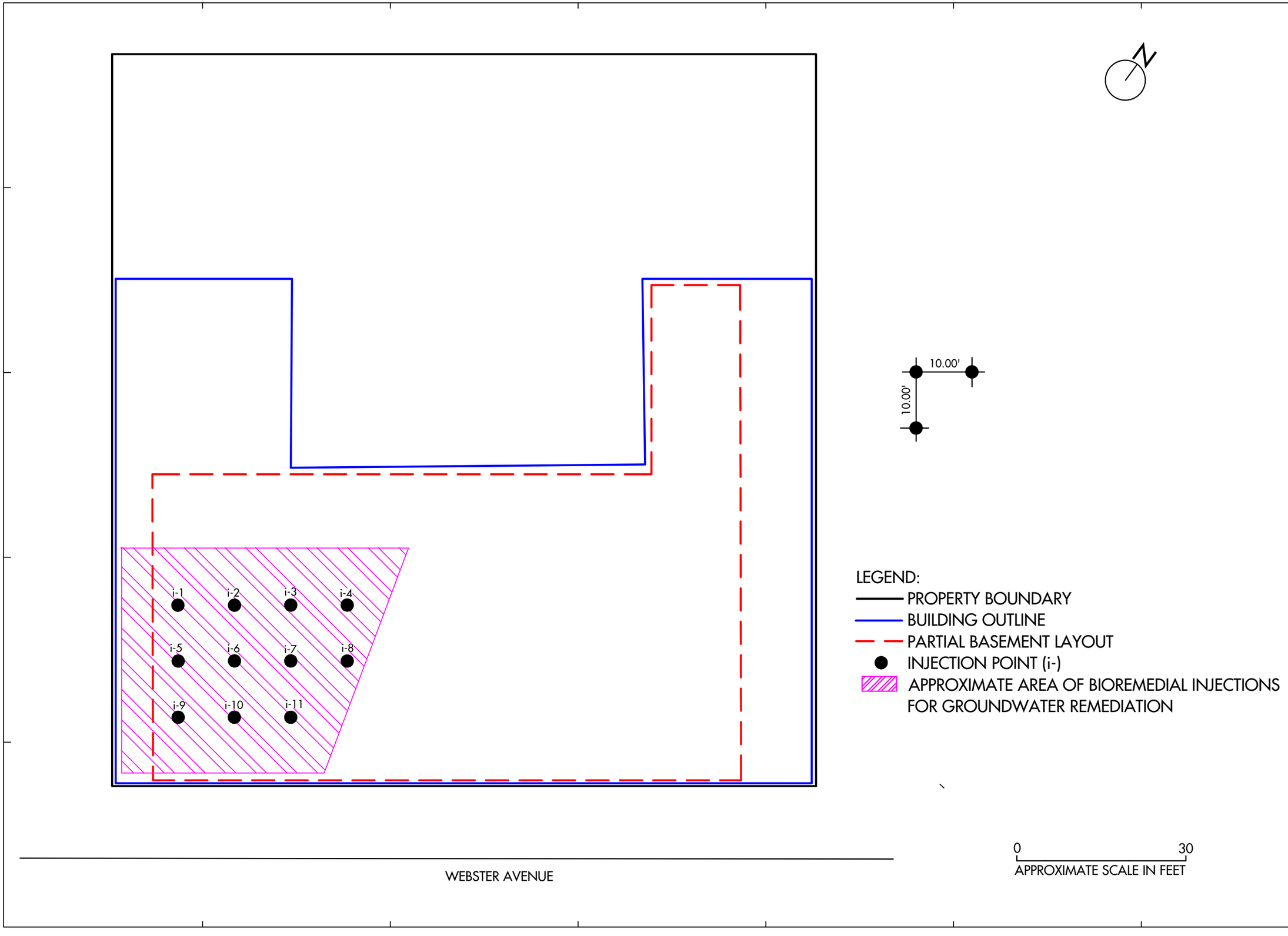
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 17: END-POINT SAMPLING PLAN

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



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BASE DRAWING PREPARED BY

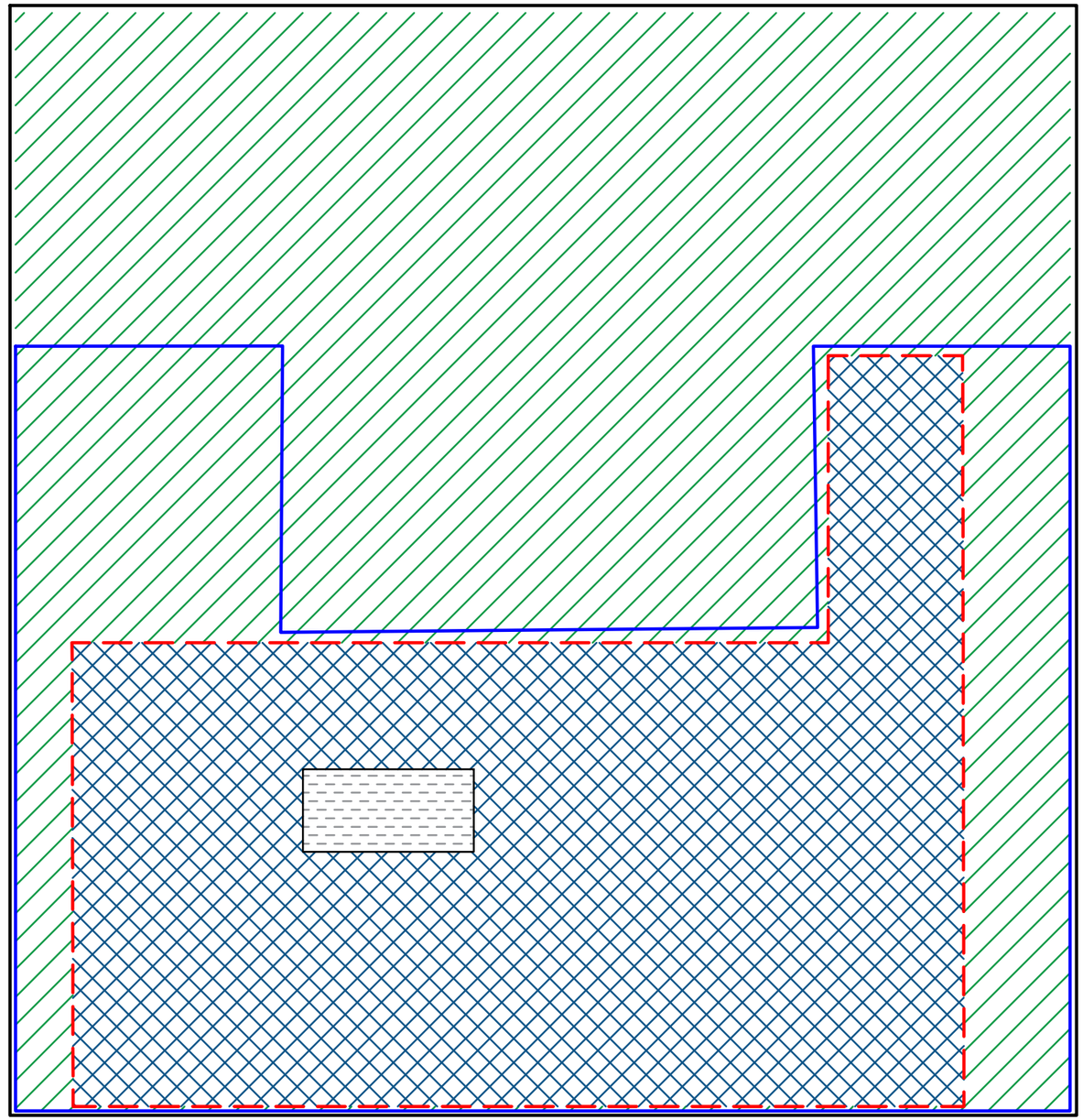
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 18: BIOREMEDIAL INJECTIONS LOCATIONS MAP

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



LEGEND:
- PROPERTY BOUNDARY
- BUILDING OUTLINE
- PARTIAL BASEMENT LAYOUT
- 6-INCH THICK CONCRETE SLAB ON-GRADE
- 12-INCH THICK CONCRETE SLAB IN BASEMENT
- 36-INCH CONCRETE MAT SLAB IN ELEVATOR PIT

WEBSTER AVENUE

0 30
APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

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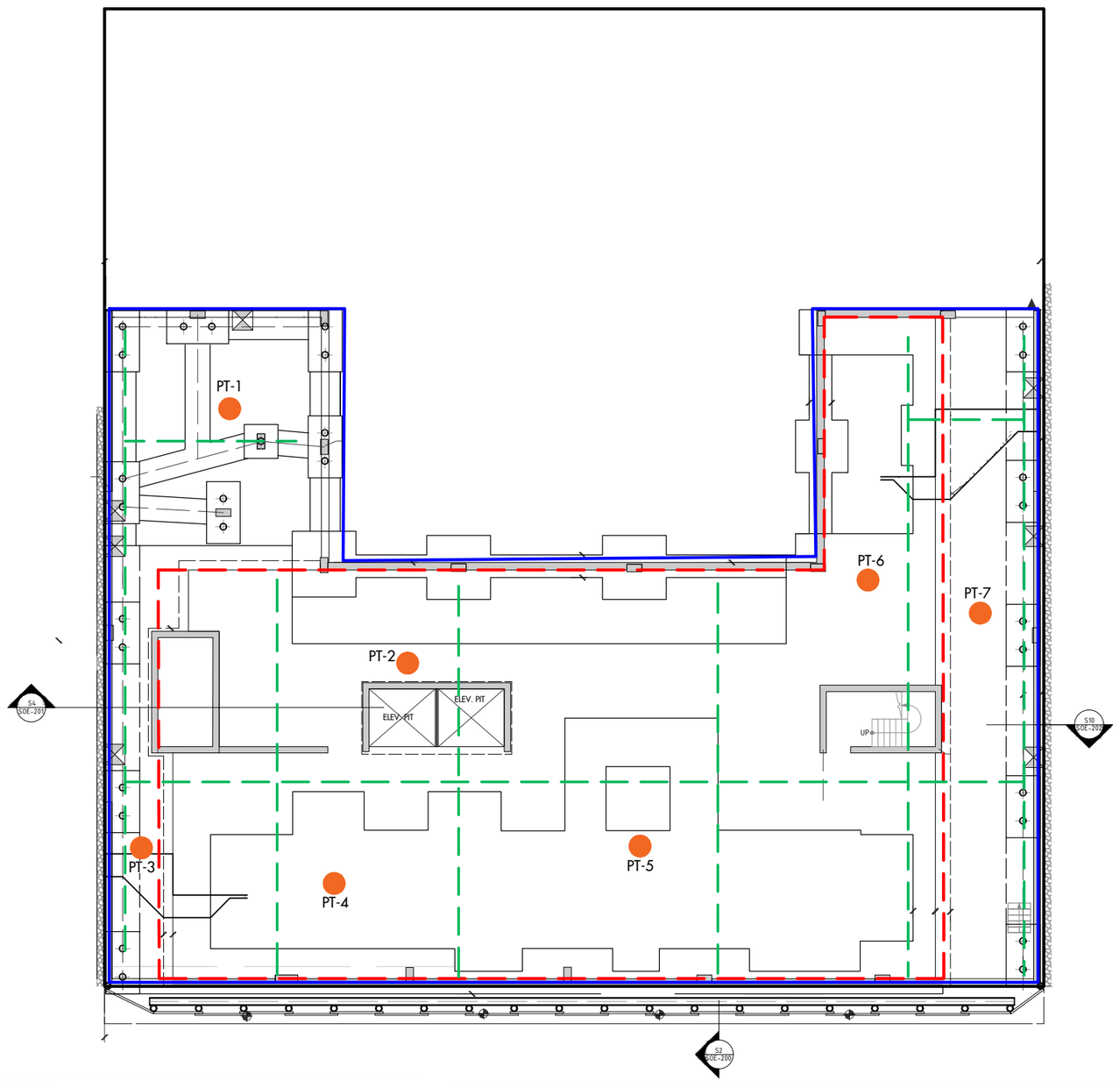
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 19: COMPOSITE COVER SYSTEM

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



WEBSTER AVENUE

LEGEND:

- PROPERTY BOUNDARY
- BUILDING OUTLINE
- PARTIAL BASEMENT LAYOUT
- 4" DIAMETER SCH-40 PERFORATED PVC PIPE EMBEDDED IN A 6" LAYER OF 3/4" BLUESTONE AT BOTTOM
- VACUUM MONITORING POINT INSTALLED UNDER SLAB AND FINISHED AT SURFACE WITH 5" DIAMETER MANHOLE COVER (PT-)

0 30

APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

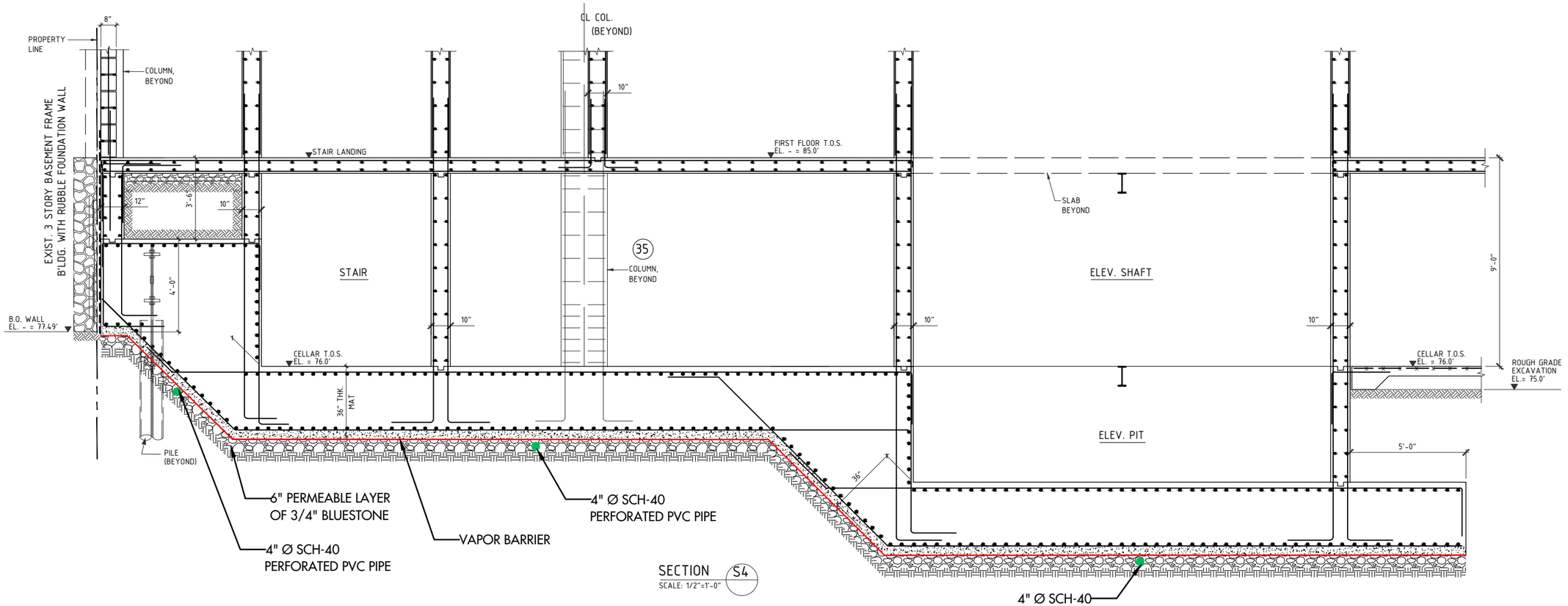
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 20A: SSDS DESIGN- PLAN VIEW

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



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DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

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TEL: (631) 462-5866

BASE DRAWING PREPARED BY

BECALL ENGINEERING SERVICES- SUPPORT OF EXCAVATION NOTES

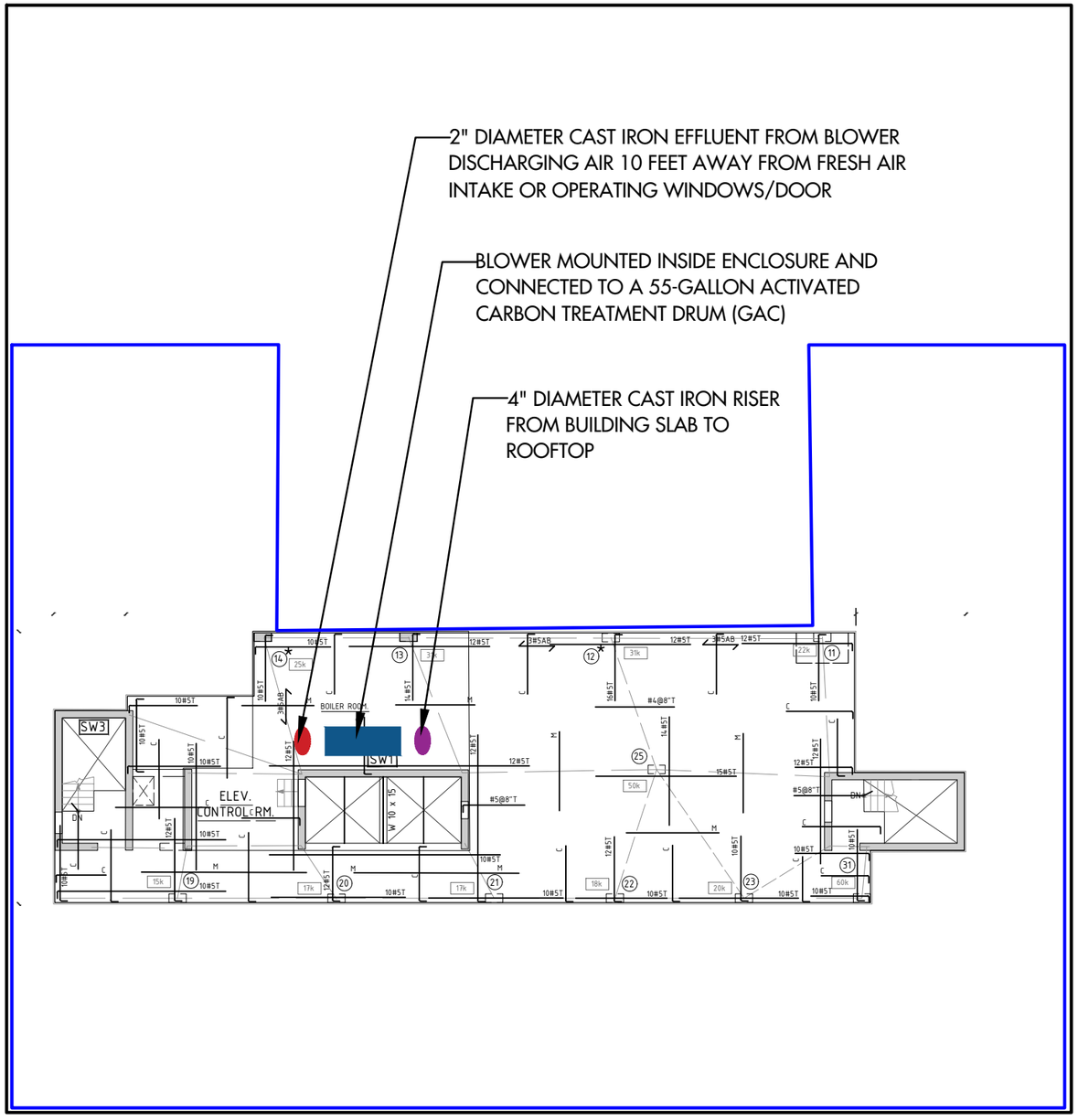
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY

PROJECT FIGURE

FIGURE 20B: SSDS DESIGN- SECTION DETAILS

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



LEGEND:

PROPERTY BOUNDARY

BUILDING OUTLINE

WEBSTER AVENUE

0 30

APPROXIMATE SCALE IN FEET

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DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

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TEL: (631) 462-5866

BASE DRAWING PREPARED BY

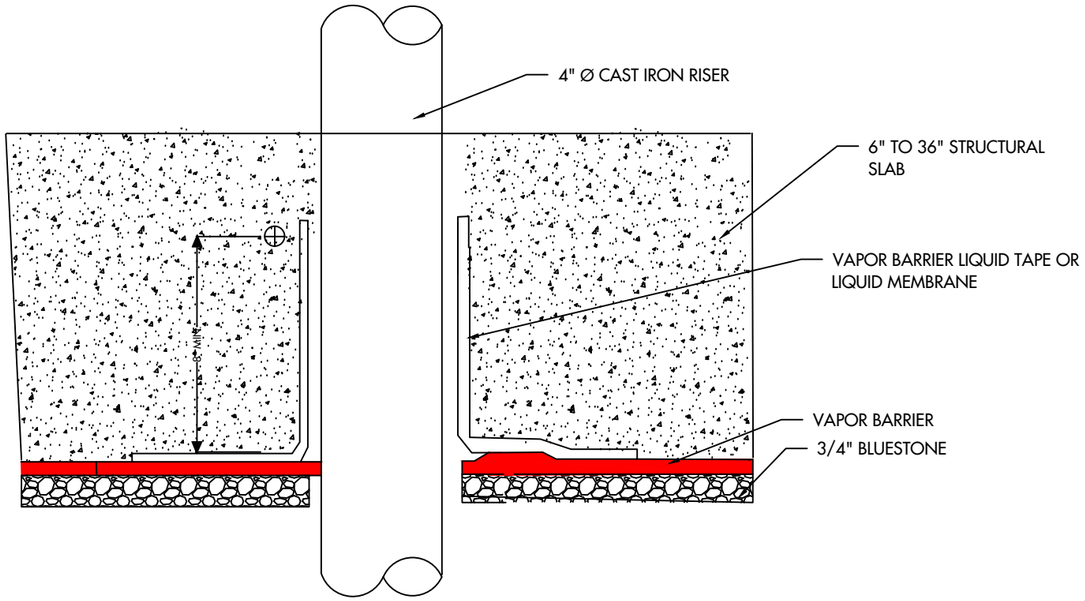
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY

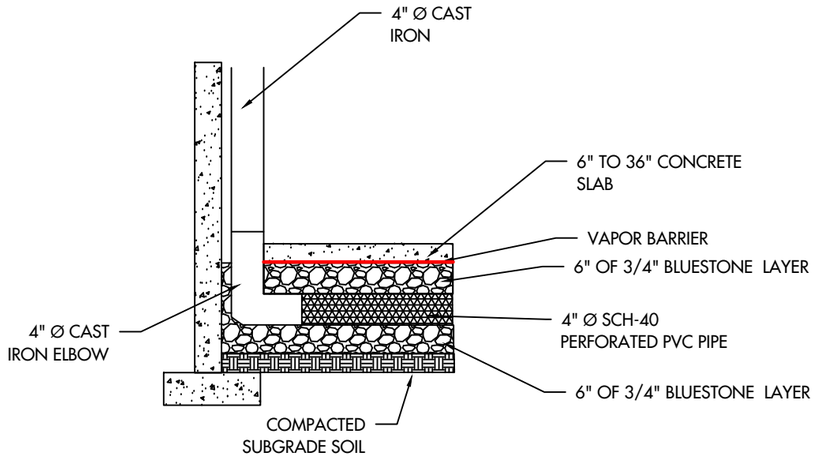
PROJECT FIGURE

FIGURE 20C: SSDS DESIGN- ROOF BULKHEAD PLAN

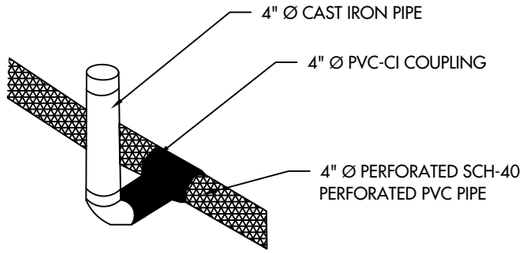
PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



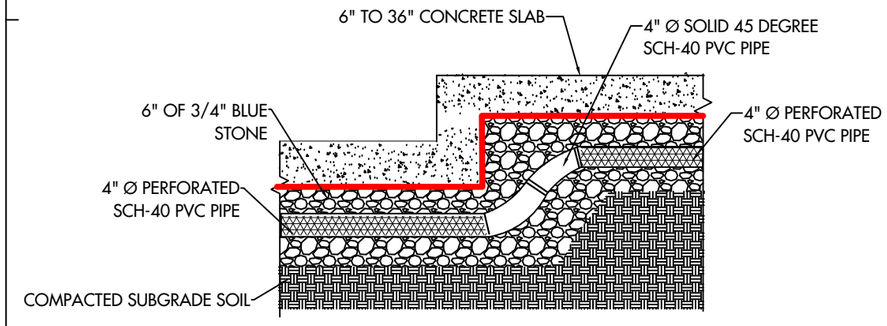
SEALING PIPE PENETRATION THROUGH THE SLAB



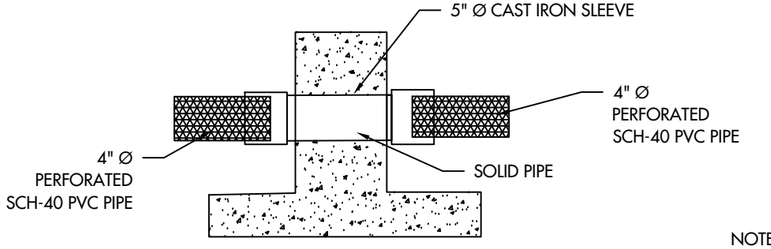
DETAIL OF RISER PIPE-SLAB PENETRATION



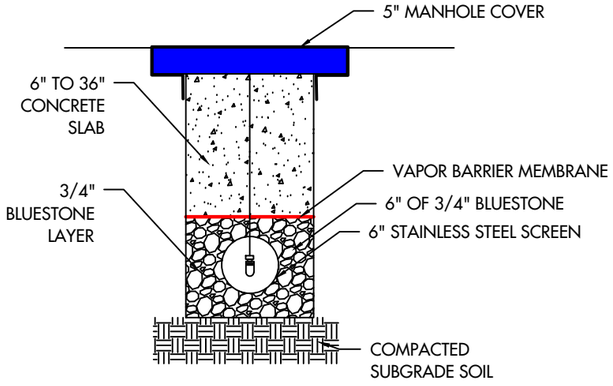
DETAIL OF SUBSLAB PIPE TO RISER CONNECTION



DETAIL OF SSDS PIPE AT STEPPED UP SLAB



DETAIL OF SLEEVE PENETRATION THROUGH GRADE BEAM AND FOUNDATION WALLS



VACUUM MONITORING POINT

NOTES:

- SECTIONS NOT TO SCALE
- TRANSITION FROM PLASTIC TO CAST IRON TO OCCUR SUB-SLAB

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DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

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231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

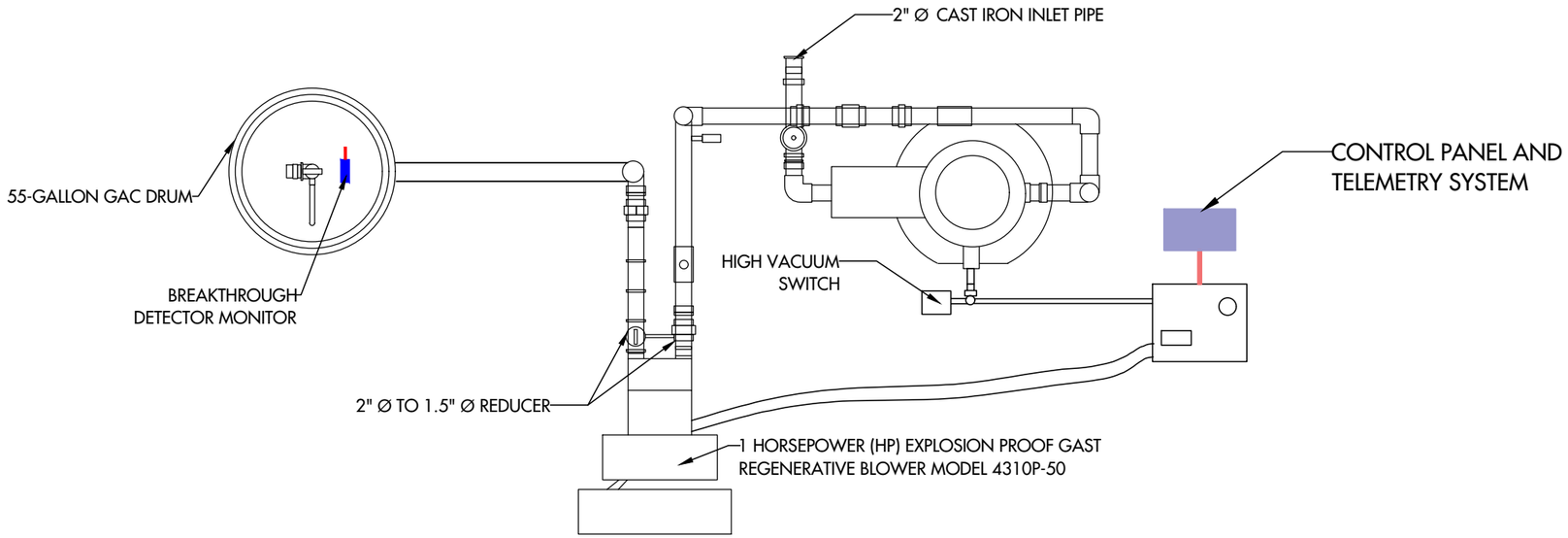
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY

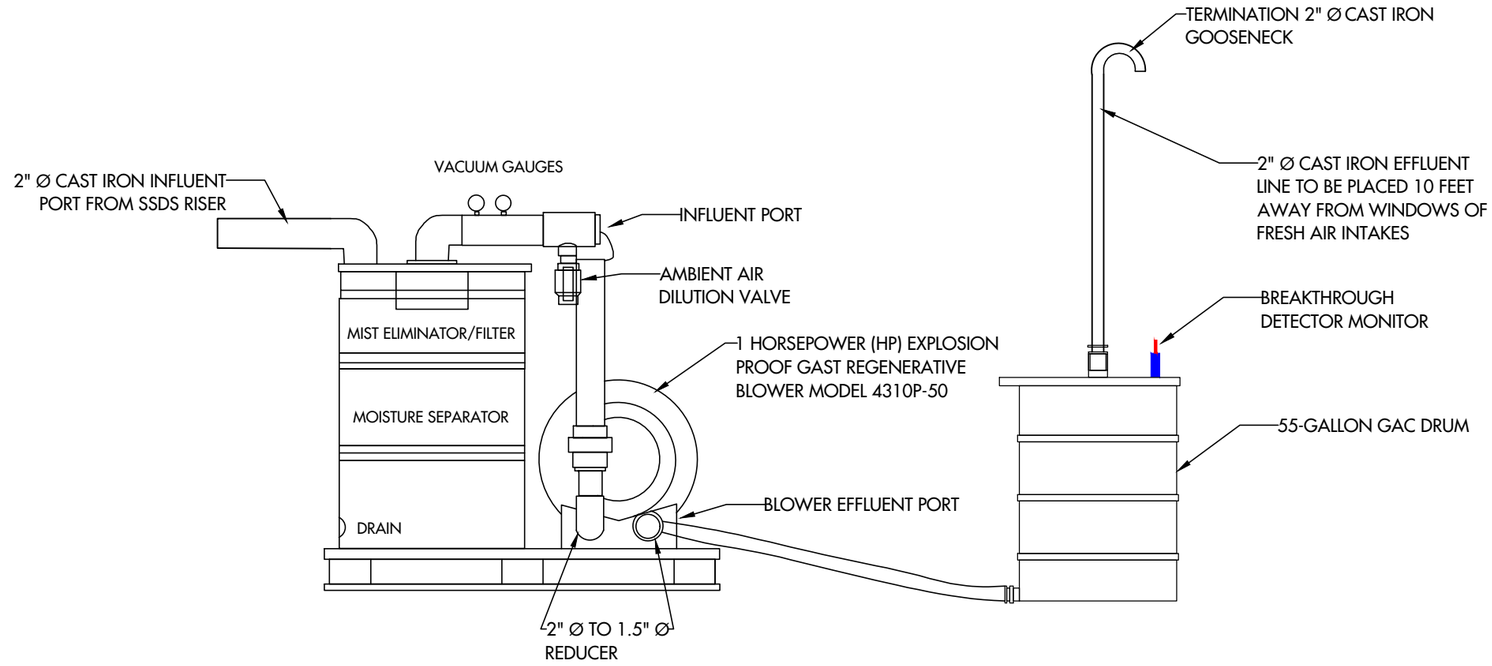
PROJECT FIGURE

FIGURE 20D: SSDS SECTIONS DETAILS

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



SSDS EQUIPMENT PLAN VIEW



SSDS EQUIPMENT CROSS SECTION VIEW

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DATE	DESCRIPTION	CHK

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231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

NEW YORK CITY DEPARTMENT OF FINANCE TAX MAP

PROJECT NAME AND ADDRESS

3083 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 20E: SSDS DESIGN- BLOWER DETAILS

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

NOTE:

1. CONCRETE FLOOR SLAB, GRAVEL AND COMPACTION PER SPECIFICATION BY OTHERS.
2. 4" DIAMETER UNDERGROUND PIPING SHALL CONSIST OF SCHEDULE-40 PVC PIPE PERFORATED WITH A STANDARD PATTERN PER ASTM D2729 WITH HOLE SIZE OF 1/2" AND HOLE SPACING OF 5+/-1/4" AND 2 HOLE ROWS SPACED 120 DEGREES ON THE LOWER SIDE.
3. PVC PIPE CONNECTION SHALL BE GLUED OR THREADED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND BE CERTIFIED LEAK-FREE BY CONTRACTOR.
4. PERFORM VACUUM COMMUNICATION TEST OF THE NEGATIVE PRESSURE FROM THE ACTIVE SSDS SUCTION NETWORK AT THE PRESSURE TEST PORTS INSTALLED INSIDE THE BUILDING SLAB. ACCEPTABLE NEGATIVE PRESSURE SHALL NOT BE LESS THAN -0.004-INCH WATER COLUMN "WC".
5. SSDS VENT REQUIRED TO BE A MINIMUM OF 10 FEET FROM ALL HVAC AIR INTAKES, DOORS, WINDOWS, OR OTHER OPENINGS INTO THE OCCUPIED SPACE OF THE BUILDING OR ADJACENT BUILDINGS
6. INTERIOR AND EXTERIOR RISER PIPING TO BE 2" OR 4" CAST IRON PIPE OR APPROVED EQUIVALENT AND APPROVED BY ALL APPLICABLE REGULATORY AGENCIES.
7. DETAIL DOES NOT DEPICT ACCURATE LOCATION OF BLOWER EQUIPMENT. SSDS EQUIPMENT CAN TYPICALLY BE NOISY AND SHALL BE PLACED IN MECHANICAL ROOMS ON ROOF OR WITH NOISE ENCLOSURE.
8. INSTALLATION OF THE SSDS MUST BE COORDINATED WITH THE INSTALLATION OF OTHER UTILITIES AND STRUCTURAL COMPONENTS.
9. ALL PIPE AND CONDUIT PENETRATIONS THROUGH THE SLAB (INCLUDING ALL TRADES), SHALL BE SEALED WITH PRE-APPROVED SEALANT.
10. CONTRACTOR SHALL PROVIDE ALL SPECIFICATIONS AND CUT SHEETS TO THE ENGINEER FOR APPROVAL PRIOR TO INSTALLATION.
11. AT ANY SUB-SURFACE UTILITY CROSSINGS, SSDS SHALL RUN ABOVE OTHER UTILITIES TO AVOID POTENTIAL WATER INFILTRATION INTO SLOTTED PVC SECTIONS.
12. SSDS BLOWER TO BE SUPPLIED TO WITH ACOUSTICAL BLANKET FOR NOISE INSULATION. EQUIPMENT IS TO CONNECTED TO CONTROL BOX SUPPLIED BY CONTRACTOR. CONTROLS SHALL INCLUDE

    1) START/STOP 2) EMERGENCY STOP
13. SSDS PIPE IS TO CONVERT TO SOLID PVC IF UNDERGROUND OR CAST IRON IF ABOVE GROUND AT ANY CROSSINGS OR SPACES.

*ALL ELECTRICAL COMPONENTS MUST BE INSTALLED BY A LICENSED ELECTRICIAN WHO HAS A WORKING KNOWLEDGE OF APPLICABLE CODE STANDARDS, AND IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS AND ALL APPLICABLE FEDERAL, STATE, AND LOCAL REQUIREMENTS.

GENERAL NOTES:

1. THE CONTRACTOR SHALL CONFER WITH AND SEEK THE APPROVAL OF THE REMEDIAL ENGINEER FOR THE FINAL LOCATIONS OF ALL SSDS COMPONENTS.
2. ALL INSPECTIONS REQUIRED BY THE BUILDING CODE SHALL BE PROVIDED BY AN INDEPENDENT INSPECTION COMPANY OR THE LOCAL BUILDING DEPARTMENT WHERE APPLICABLE.
3. THE VENTING SYSTEM SHALL BE IN COMPLIANCE WITH NEW YORK CITY MECHANICAL CODE, CHAPTER 5 SECTION MC-512 SUBSLAB EXHAUST SYSTEMS.
4. VERTICAL PIPING RUNS SHALL BE MARKED "SOIL VAPOR VENTING SYSTEM-DO NOT TAMPER WITH OR DISTURB". THE LABELS SHALL BE EASILY READ WITHIN 3 FEET.
5. A/E TO EVALUATE RISER LOCATION WITH ENGINEER. SSDS RISER MUST BE 2" OR 4" CAST IRON OR APPROVED EQUIVALENT. RISER CAN BE PLACED ANYWHERE ALONG HORIZONTAL PIPING RUN, TYPICALLY INSIDE PIPE CHASE OR ELEVATOR SHAFT.
6. THE SELECTED CONTRACTOR MUST CONFORM TO ALL INSTALLATION INSTRUCTIONS AS PROVIDED PER THE MANUFACTURER SPECIFICATIONS..

CONTRACTOR NOTES:

1. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIAL, EQUIPMENT, SUPPLIES AND INCIDENTALS REQUIRED FOR THE INSTALLATION OF THE SYSTEM AS SHOWN ON THE DRAWINGS. THE WORK SHALL INCLUDE BUT NOT LIMITED TO THE FOLLOWING: SSDS AND SOIL VAPOR BARRIER INSTALLATION, INSTALLATION OF ASSOCIATED PIPING, MECHANICAL OR ELECTRICAL APPURTENANCES IN THEIR ENTIRETY, AND BLOWER INSTALLATION IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL REQUIREMENTS.
2. THE CONTRACTOR IS REQUIRED TO CONFORM TO ALL APPLICABLE FEDERAL,STATE AND NEW YORK CITY REQUIREMENTS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE TO COMPLY WITH ALL SUCH RULES AND REGULATIONS CONCERNING EMISSIONS AND DISPOSAL OF SOLIDS AND OTHER MATERIALS GENERATED BY THE WORK. CONTAINMENT, HANDLING AND DISPOSAL OF MATERIALS, AND MEANS AND METHODS EMPLOYED BY THE CONTRACTOR ARE THE RESPONSIBILITY OF THE CONTRACTOR.
4. COMPLIANCE ASSURANCE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. COMMUNICATION BETWEEN CONTRACTOR AND GOVERNING AUTHORITIES, REGULATORY AGENCIES AND SIMILAR ENTITIES, SHALL BE COORDINATED THROUGH THE OWNER.
5. ALL PERMITS, BONDS, EASEMENTS OR LICENSES REQUIRED TO PERFORM THE WORK SHALL BE OBTAINED BY THE CONTRACTOR.
6. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER TO ENSURE ALL PERMITS ARE IN PLACE PRIOR TO THE CONTRACTOR STARTING WORK.
7. DETERMINATION OF LICENSE AND PERMIT REQUIREMENTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
8. COPIES OF ALL EXECUTED PERMITS AND LICENSES SHALL BE TRANSMITTED TO THE OWNER UPON RECEIPT.

SUBMITTALS:

1. THE CONTRACTOR SHALL SUBMIT THE FOLLOWING ITEMS TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO COMMENCEMENT OF WORK:

A. PROPOSED METHODS OF PIPING INSTALLATION, BLOWER INSTALLATION AND ALL ACCESSORY INSTALLATION INCLUDING COLLECTION AND OFF- SITE TRANSPORTATION AND DISPOSAL OF WASTE.

B. PROPOSED METHODS, EQUIPMENT AND SEQUENCE OF OPERATIONS

CONTRACTOR NOTES:

1. CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM CAST IRON AND SHALL CONFORM TO ASTM F480. CAST IRON PIPE SHALL BE SPECIFIED, OR APPROVED EQUIVALENT. ALL SUBSURFACE SSDS SYSTEM PIPING TO BE 4" DIAMETER AND AS SYSTEM PIPING TO BE 2" OR 4" DIAMETER UNLESS OTHERWISE NOTED.
2. ALL PIPE AND FITTINGS SHALL BE MARKED WITH COLLECTIVE TRADEMARK OF THE PLASTIC PIPE INSTITUTE AND LISTED BY NSF INTERNATIONAL.
3. ALL PIPE AND FITTINGS TO BE PRODUCED BY A SINGLE MANUFACTURER AND ARE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS AND APPLICABLE CODE REQUIREMENTS. COUPLINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS BAND TIGHTENING SEQUENCE AND TORQUE RECOMMENDATIONS.
4. CAST IRON PIPE TO BE SECURED TO BUILDING USING STEEL TIE BACK SECURING STRAPS AT 12" VERTICAL LEVELS.

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DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

PROJECT NAME AND ADDRESS

3083 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 20F: SSDS DESIGN-CONTRACTOR NOTES

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

APPENDICES

Appendix A

Property Metes and Bounds

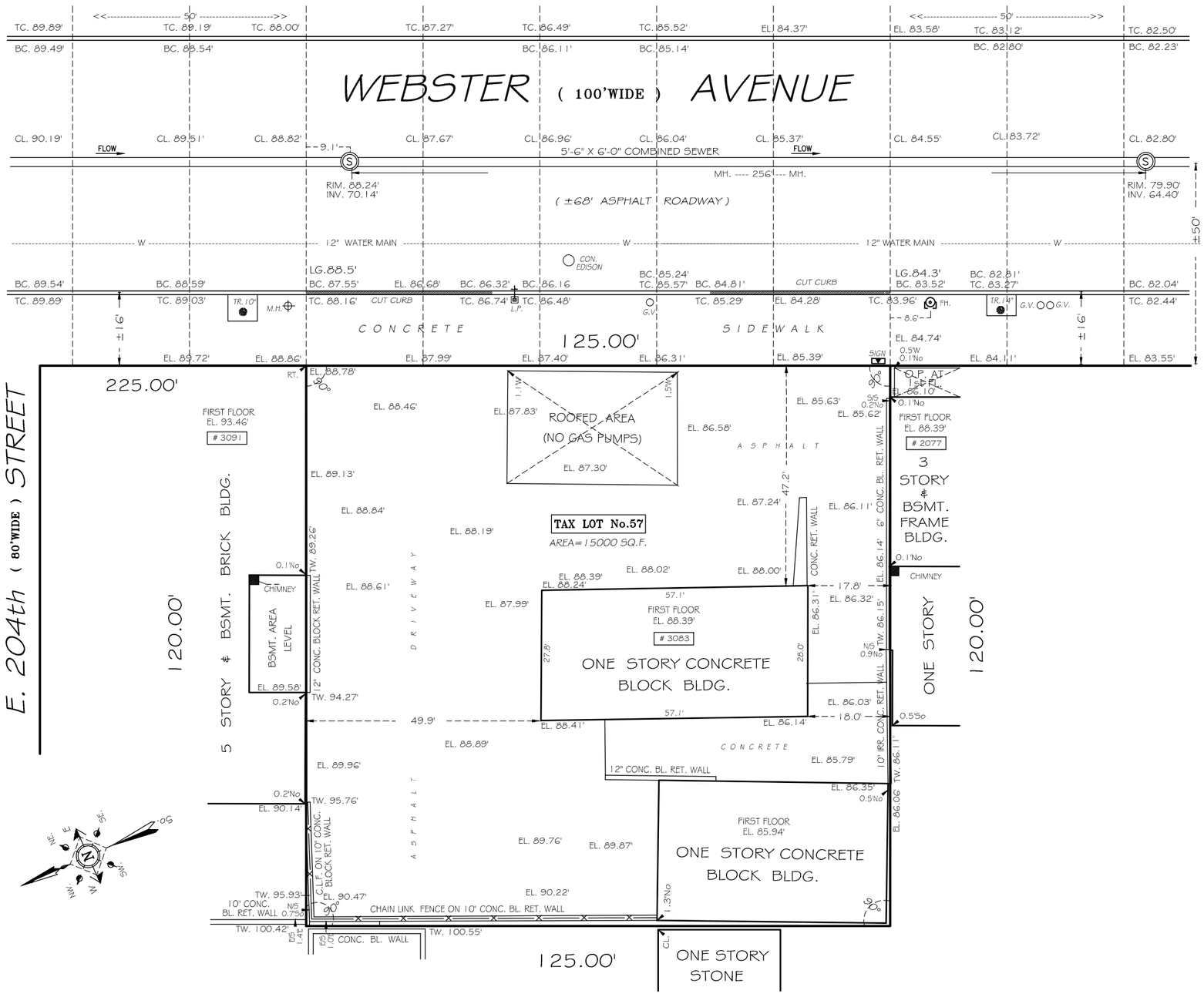
(FOR TITLE PURPOSES)

LEGEND

No. NORTH | So. SOUTH | E. EAST | F.E. FIRE ESCAPE | W.W. WINDOW WELL | C.D. CELLAR DOOR | ENT.UND. ENT. UNDER | ENT. ENTRANCE | L.A. LOW AREA | A. AREAWAY | CL. CLEAR | RT. RIGHT

LIGHT POST | UTILITY POLE | CATCH BASIN | WATER VALVE | GAS VALVE | PARKING METER | TRAFFIC SIGN | HYDRANT HYD. | E. ELECTRIC BOX | TREE PIT | SEWER MANHOLE | ELECTRIC MANHOLE | TELEPHONE MANHOLE | D.W.S WATER

JOB # 24707-BX



SURVEYED

MAY 24, 2024

UNAUTHORIZED ALTERATIONS OR ADDITIONS TO THIS SURVEY IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW. COPIES OF THIS SURVEY MAP NOT BEARING THE LAND SURVEYOR'S INKED SEAL OR EMBOSSED SEAL SHALL NOT BE CONSIDERED TO BE A VALID TRUE COPY. GUARANTEES OR CERTIFICATIONS INDICATED HEREON SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED, AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. GUARANTEES OR CERTIFICATION ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.

BLOCK:	3331
LOT (s):	57
SECTION:	12
COUNTY:	BRONX
DWG BY:	Srdjan B.
CHK'D BY:	

ARCHITECTURAL SURVEY

CAUTION: BEFORE PERFORMING ANY DIGGING OR DRILLING ON THIS SITE, IT IS REQUIRED THAT SUBSURFACE SERVICES, INCLUDING THE UNDERGROUND MAINS BE MARKED AND IDENTIFIED BY THE UTILITY INVOLVED IN COMPLIANCE WITH INDUSTRIAL CODE 53 OF NEW YORK STATE.

1) ALL ELEVATIONS REFER TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) WHICH IS 1.508 FEET ABOVE THE BRONX TOPOGRAPHICAL DATUM

2) UNDERGROUND UTILITY INFORMATION SHOWN WAS OBTAINED FROM VARIOUS COMPANIES AND CITY AGENCIES AND IS NOT GUARANTEED FOR ACCURACY OR COMPLETENESS.

3) THIS IS TO CERTIFY THAT THERE ARE NO APPARENT STREAMS NOR NATURAL WATER COURSES IN THE PROPERTY AS SHOWN ON THIS SURVEY

SCALE: 1"=25'

STATEWIDE LAND SURVEYING P.C.
VINCENT M. TEUTONICO
N.Y.S LIC. No.050307
OFF.(914)365-1847 ; FAX (914)365-1849
E-mail: BIGAPPLELS@YAHOO.COM

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.

2024050100183001001EC814

RECORDING AND ENDORSEMENT COVER PAGE **PAGE 1 OF 4**

Document ID: 2024050100183001 Document Date: 04-25-2024 Preparation Date: 05-01-2024
Document Type: DEED
Document Page Count: 3

PRESENTER:
RECORD & RETURN TITLE AGENCY, INC.
RR-B-47514-23 JML
7 DEMPSEY PLACE
EASTCHESTER, NY 10709
914-395-2285
POSTCLOSING@RECORDANDRETURN.COM

RETURN TO:
RECORD & RETURN TITLE AGENCY, INC.
RR-B-47514-23 JML
7 DEMPSEY PLACE
EASTCHESTER, NY 10709
914-395-2285
POSTCLOSING@RECORDANDRETURN.COM

PROPERTY DATA

Borough	Block	Lot	Unit	Address
BRONX	3331	57	Entire Lot	3083 WEBSTER AVENUE

Property Type: COMMERCIAL REAL ESTATE

CROSS REFERENCE DATA

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

PARTIES

GRANTOR/SELLER:
3083 WEBSTER REALTY LLC
C/O: TUMAY BASARANLAR, 555 S. COLUMBUS AVENUE, #201
MOUNT VERNON, NY 10550

GRANTEE/BUYER:
3083 WEBSTER AVENUE HOUSING DEVELOPMENT FUND CORP.
14 COMLY TERRACE
GREENWICH, CT 06831

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:	$	52.00
Affidavit Fee:	$	0.00

Filing Fee: $ 250.00

NYC Real Property Transfer Tax: $ 183,750.00

NYS Real Estate Transfer Tax: $ 45,500.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 05-01-2024 16:25
City Register File No.(CRFN): **2024000111752**

City Register Official Signature

BARGAIN AND SALE DEED WITH COVENANTS AGAINST GRANTOR'S ACTS

THIS INDENTURE, made as of the 25th day of April, 2024, by

3083 WEBSTER REALTY LLC
having an address of c/o Tumay Basaranlar, 555 S. Columbus Avenue, #201, Mount Vernon, NY 10550
(hereinafter referred to as "Grantor").

TO

3083 WEBSTER AVENUE HOUSING DEVELOPMENT FUND CORPORATION
having an address of 14 Comly Terrace, Greenwich, CT 06831
(hereinafter referred to as "Grantee").

WITNESSETH, that the party of the first part, in consideration of Ten Dollars and No Cents ($10.00), lawful money of the United States, paid by the party of the second part, does hereby grant and release unto the party of the second part, the heirs or successors and assigns of the party of the second part forever,

ALL that certain plot, piece or parcel of land with the building and improvements thereon erected, situate, lying and being, more particularly described on Exhibit A attached hereto and made a part hereof (the "Premises");

TOGETHER with all right, title and interest, if any, of the party of the first part in and to any streets and roads abutting the above described premises to the center lines thereof,

TOGETHER with the appurtenances and all the estate and rights of the party of the first part in and to said premises,

TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, the heirs or successors and assigns of the party of the second part forever.

AND the party of the first part, covenants that the party of the first part has not done or suffered anything whereby the said premises have been encumbered in any way whatever, except as aforesaid.

AND the party of the first part, in compliance with Section 13 of the Lien Law, covenants that the party of the first part will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

SAID PREMISES being the same premises originally conveyed to Grantor by Deed, Dated December 22, 2020 and Recorded December 30, 2020 in CRFN 2020000372106 in the Bronx County Office of the Register of the City of New York. Said Premises being known as and located at 3083-3087 Webster Avenue, Bronx, New York 10467.

The word "party" shall be construed as if it read "parties" whenever the sense of this indenture so requires.

RECORDED AT THE REQUEST OF
RECORD & RETURN TITLE AGENCY
TITLE# RR-D-47514-23
THRU: ___AMT ___FA ✓ORT
___STIC ___STG

Record and Return Title Agency, Inc.
Old Republic Title Insurance Company

Title Number: **RR-B-47514-23**

SCHEDULE A DESCRIPTION

AMENDED 04/12/2024

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

BEGINNING at a point on the northwesterly side of Webster Avenue, distant 225.00 feet southwesterly from the southwesterly corner of Webster Avenue and East 204th Street (formerly Scott Avenue), as the same formerly existed;

RUNNING THENCE northwesterly at right angles to Webster Avenue, one hundred and twenty (120.00) feet;

THENCE southwesterly parallel with Webster Avenue 125.00 feet;

THENCE southeasterly, at right angles to Webster Avenue, 120 feet to the northwesterly side of Webster Avenue; and

THENCE northeasterly along the northwesterly side of Webster Avenue, 125.00 feet to the point or place of BEGINNING.

IN WITNESS WHEREOF, Grantor has duly executed this deed the day and year first above written.

GRANTOR:
3083 WEBSTER REALTY LLC

By: _____
Name: Tunay Basaranlar
Title: Authorized Signatory

IN PRESENCE OF

_____

Acknowledgement taken in New York State

STATE OF NEW YORK)
) ss.:
COUNTY OF Westchester)

On the 23rd **day of April, 2024**, before me, the undersigned, a Notary Public in and for said state, personally appeared Tunay Basaranlar, personally known to me or proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the person, or the entity upon behalf of which the person acted, executed the instrument.

_____
Notary Public

Charline Polanco
STATE OF NEW YORK
NOTARY PUBLIC
Qualified in Bronx County
01PO6368348
MY COMMISSION EXPIRES 12/11/2025

DEED

Title No.:

Block **3331**
Lot **57**

County: **Bronx**
Street Address: **3083-3087 Webster Avenue**
Bronx, New York 10467

3083 WEBSTER REALTY LLC
to
3083 WEBSTER AVENUE HOUSING DEVELOPMENT FUND CORPORATION

Return By Mail To:

Record and Return Title Agency, Inc.
7 Dempsey Place
Eastchester, NY 10709

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

2024050100183001001S0695

SUPPORTING DOCUMENT COVER PAGE **PAGE 1 OF 1**

Document ID: 2024050100183001 Document Date: 04-25-2024 Preparation Date: 05-01-2024
Document Type: DEED

ASSOCIATED TAX FORM ID: 2024042200333

SUPPORTING DOCUMENTS SUBMITTED:

	Page Count
DEP CUSTOMER REGISTRATION FORM FOR WATER AND SEWER BILLING	2
RP - 5217 REAL PROPERTY TRANSFER REPORT	3

The City of New York
Department of Environmental Protection
Bureau of Customer Services
59-17 Junction Boulevard
Flushing, NY 11373-5108

Customer Registration Form for Water and Sewer Billing

Property and Owner Information:

(1) **Property receiving service: BOROUGH: BRONX** **BLOCK: 3331** **LOT: 57**

(2) **Property Address: 3083 WEBSTER AVENUE, BRONX, NY 10467**

(3) **Owner's Name:** **3083 WEBSTER AVENUE HOUSING DEVELOPMENT FUND CORP.**

Additional Name: 6014 BCO Realty LLC

Affirmation:

☑ Your water & sewer bills will be sent to the ~~property address shown above~~ Alternate Address below.

6014 BCO Realty LLC
1144 Evergreen Avenue, Suite 1144-1
Bronx NY 10472

Customer Billing Information:

Please Note:

A. Water and sewer charges are the legal responsibility of the owner of a property receiving water and/or sewer service. The owner's responsibility to pay such charges is not affected by any lease, license or other arrangement, or any assignment of responsibility for payment of such charges. Water and sewer charges constitute a lien on the property until paid. In addition to legal action against the owner, a failure to pay such charges when due may result in foreclosure of the lien by the City of New York, the property being placed in a lien sale by the City or Service Termination.

B. Original bills for water and/or sewer service will be mailed to the owner, **at the property address or to an alternate mailing address**. DEP will provide a duplicate copy of bills to one other party (such as a managing agent), however, any failure or delay by DEP in providing duplicate copies of bills shall in no way relieve the owner from his/her liability to pay all outstanding water and sewer charges. Contact DEP at (718) 595-7000 during business hours or visit www.nyc.gov/dep to provide us with the other party's information.

Owner's Approval:

The undersigned certifies that he/she/it is the owner of the property receiving service referenced above; that he/she/it has read and understands Paragraphs A & B under the section captioned "Customer Billing Information"; and that the information supplied by the undersigned on this form is true and complete to the best of his/her/its knowledge.

Print Name of Owner:

Signature: _____ Date (mm/dd/yyyy)

Name and Title of Person Signing for Owner, if applicable:

CUSTOMER REGISTRATION FORM FOR WATER & SEWER BILLING

Owner's Approval:

The undersigned certifies that he/she/it is the owner of the property receiving service referenced above; that he/she/it has read and understands Paragraphs A & B under the section captioned "Customer Billing Information"; and that the information supplied by the undersigned on this form is true and complete to the best of his/her/its knowledge.

Print Name of Owner:

Signature:

6014 BCD REALTY LLC, a New York limited liability company

By: 6014 BCD MM LLC, its managing member

By: 6014 BCD Member LLC, its manager

By: _____
Name: Ayush Kapahi
Title: Manager

FOR CITY USE ONLY

C1. County Code | | C2. Date Deed Recorded | / / | Month Day Year

C3. Book OR C4. Page | | | |

C5. CRFN | |

REAL PROPERTY TRANSFER REPORT

STATE OF NEW YORK
STATE BOARD OF REAL PROPERTY SERVICES

RP - 5217NYC

PROPERTY INFORMATION

1. Property Location: 3083 (STREET NUMBER) | WEBSTER AVENUE (STREET NAME) | BRONX (BOROUGH) | 10467 (ZIP CODE)

2. Buyer Name: 3083 WEBSTER AVENUE HOUSING DEVELOPMENT FUND CORP. (LAST NAME / COMPANY) | (FIRST NAME)

(LAST NAME / COMPANY) | (FIRST NAME)

3. Tax Billing Address: Indicate where future Tax Bills are to be sent if other than buyer address (at bottom of form) | (LAST NAME / COMPANY) | (FIRST NAME)

(STREET NUMBER AND STREET NAME) | (CITY OR TOWN) | (STATE) | (ZIP CODE)

4. Indicate the number of Assessment Roll parcels transferred on the deed: 1 # of Parcels OR ☐ Part of a Parcel

4A. Planning Board Approval - N/A for NYC

4B. Agricultural District Notice - N/A for NYC

5. Deed Property Size: | (FRONT FEET) X | (DEPTH) OR | (ACRES)

Check the boxes below as they apply:

6. Ownership Type is Condominium ☐

7. New Construction on Vacant Land ☐

8. Seller Name: 3083 WEBSTER REALTY LLC (LAST NAME / COMPANY) | (FIRST NAME)

(LAST NAME / COMPANY) | (FIRST NAME)

9. Check the box below which most accurately describes the use of the property at the time of sale:

A ☐ One Family Residential
B ☐ 2 or 3 Family Residential
C ☐ Residential Vacant Land
D ☐ Non-Residential Vacant Land
E ☑ Commercial
F ☐ Apartment
G ☐ Entertainment / Amusement
H ☐ Community Service
I ☐ Industrial
J ☐ Public Service

SALE INFORMATION

10. Sale Contract Date: 7 / 5 / 2023 (Month / Day / Year)

11. Date of Sale / Transfer: 4 / 25 / 2024 (Month / Day / Year)

12. Full Sale Price $ 7,000,000

(Full Sale Price is the total amount paid for the property including personal property. This payment may be in the form of cash, other property or goods, or the assumption of mortgages or other obligations.) *Please round to the nearest whole dollar amount.*

13. Indicate the value of personal property included in the sale | |

14. Check one or more of these conditions as applicable to transfer:

A ☐ Sale Between Relatives or Former Relatives
B ☐ Sale Between Related Companies or Partners in Business
C ☐ One of the Buyers is also a Seller
D ☐ Buyer or Seller is Government Agency or Lending Institution
E ☐ Deed Type **not** Warranty or Bargain and Sale (Specify Below)
F ☐ Sale of Fractional or Less than Fee Interest (Specify Below)
G ☐ Significant Change in Property Between Taxable Status and Sale Dates
H ☐ Sale of Business is Included in Sale Price
I ☐ Other Unusual Factors Affecting Sale Price (Specify Below)
J ☑ None

ASSESSMENT INFORMATION - Data should reflect the latest Final Assessment Roll and Tax Bill

15. Building Class: G 4

16. Total Assessed Value (of all parcels in transfer): 423,000

17. Borough, Block and Lot / Roll Identifier(s) (If more than three, attach sheet with additional identifier(s))

BRONX 3331 57 | | |

20240422003332010 4

CERTIFICATION

I certify that all of the items of information entered on this form are true and correct (to the best of my knowledge and belief) and understand that the making of any willful false statement of material fact herein will subject me to the provisions of the penal law relative to the making and filing of false instruments.

BUYER

BUYER SIGNATURE | DATE

14 COMLY TERRACE

STREET NUMBER | STREET NAME (AFTER SALE)

GREENWICH | CT | 06831

CITY OR TOWN | STATE | ZIP CODE

BUYER'S ATTORNEY

LAST NAME | FIRST NAME

AREA CODE | TELEPHONE NUMBER

SELLER

SELLER SIGNATURE | DATE 4/23/2024

see attached

2024042200333201

BUYER

3083 WEBSTER AVENUE HOUSING DEVELOPMENT FUND CORPORATION,
A New York not-for-profit corporation

By: _____
Name: Shannon Chang
Title: Vice President

STATE OF NEW YORK ~~California~~)
)SS.:
COUNTY OF Los Angeles)

On this 24 day of April, 2024, before me, the undersigned, personally appeared **SHANNON CHANG**, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that she/he/they executed the same in her/his/their capacity and that by her/his/their signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

KAYLEEN TRINH
Notary Public · California
Los Angeles County
Commission # 2391654
My Comm. Expires Jan 25, 2026

_____
Notary Public
Commission expires

Appendix B

Summary of Soil, Groundwater and Soil Vapor Sampling Details

Summary of Soil Sampling Locations, Depths and Analyses 3083 Webster Avenue, Bronx, NY

Investigation Phase	Soil Probe/Soil Sample ID	Site-Specific Location	Soil Characterization Depth (Feet bgs)	Samples Chosen For Analysis (Feet bg)	Sample Selection Criteria	Analytical Methods
Post-Tank Removal Sampling by Tyree in 1998	Sample 1	Former tank pits in the southeastern portion (sampling map not available)	5, 7 and 8		Sidewall and bottom endpoint samples from tank pit	*TCL VOCs via EPA Method 8021 + MTBE
	Sample 2					
	Sample 3					
	Sample 4					
	Sample 5					
	Sample 6					
	Sample 7					
	Sample 8					
	Sample 9					
	Sample 1 (Composite)		Bottom of tank pit (depth not specified)		Bottom endpoint sample from tank pit	*TCL VOCs via EPA Method 8021 + MTBE *RCRA Metals via EPA Method 6010 & EPA Method 7471 for Mercury
Subsurface Investigation by Tyree in October 2009	SB-1	Former tank pits in the sourtheastern portion	13 feet bgs	10-13	Deep soil probes samples	*TCL VOCs via EPA Method 8260 (CP-51 list) *TCL SVOCs via EPA Method 8270 (CP-51 list)
	SB-2		17 feet bgs	15-17		
	SB-3		27 feet bgs	25-27		
	SB-4		13 feet bgs	11-13		
	SB-5		20 feet bgs	18-20		
	SB-6	Former tank pit in the northern portion	15 feet bgs	12-15		
Post-Tank Removal Sampling by LaBella in August/September 2021	PE-1	Tank pits for two 4,000-gallon gasoline USTs in southeastern portion	Max. 8 feet bgs	5-6	Shallow sidewall endpoint samples	*TCL VOCs via EPA Method 8260 (CP-51 list) *TCL SVOCs via EPA Method 8270 (CP-51 list)
	PE-2			7-8		
	PE-3			7-8		
	PE-4			7-8		
	LB-1		12 feet bgs	11-12	Deep sidewall endpoint samples	
	LB-2			11-12		
	LB-3			11-12		
	LB-4			11-12		
	PE-5	Vicinity of product line in the mid-southern portion	Max. 5 feet bgs	3-4	Endpoint under poduct line	
	PE-6			3-4		
	PE-7			4-5		
	TP-1	Area between tank pit and dispenser island in the southern portion	18 feet bgs	18	Bottom grab sample of Test pit	
	Disp-1		Max. 4 feet bgs	2-3	Endpoint Under Dispenser	
	Disp-2			3-4		
Phase II ESA by AEC in December 2021	B-1	Southwestern portion	20 feet bgs	20	Deep soil probes samples	*TCL VOCs via EPA Method 8260 (CP-51 list) *TCL SVOCs via EPA Method 8270 (CP-51 list)
	B-2	Southwestern portion	20 feet bgs	20		
	B-3	Southeastern portion/Former tank pit	15 feet bgs	15		
	B-4	Southeastern portion	18 feet bgs	18		
	B-5	Mid-eastern portion	14 feet bgs	14		
	B-6	Northeastern portion	9 feet bgs	9		
NYC OER Remedial Investigation by HydroTech in August 2024	SP-1	Northwestern portion	4 feet bgs	0-2	Shallow soil probe sample	*TCL VOCs via EPA Method 8260 *TCL SVOCs via EPA Method 8270 * Pesticides via EPA Method 8081 * Polychlorinated biphenyls via EPA Method 8082 *TAL Metals via EPA Method 6010 & EPA Method 7471 for Mercury *21 target Perfluorooctanoic acid (PFOA) via Modified EPA Method 537
				2-4	Deep soil probe sample	
	SP-2	Northwestern portion	12 feet bgs	0-2	Shallow soil probe sample	
				10-12	Deep soil probe sample	
	SP-3	Northeastern portion	12 feet bgs	0-2	Shallow soil probe sample	
				10-12	Deep soil probe sample	
	SP-4	Central portion	12 feet bgs	0-2	Shallow soil probe sample	
				10-12	Deep soil probe sample	
	SP-5	Mid-western portion	12 feet bgs	0-2	Shallow soil probe sample	
				10-12	Deep soil probe sample	
	SP-6	Northeastern portion	4 feet bgs	0-2	Shallow soil probe sample	
				2-4	Deep soil probe sample	
	SP-7	Mid-southern portion/Former tank pit	12 feet bgs	0-2	Shallow soil probe sample	
				10-12	Deep soil probe sample	
	SP-8	Southwestern portion	18 feet bgs	0-2	Shallow soil probe sample	
				16-18	Deep soil probe sample	
NYSDEC BCP Remedial Investigation by HydroTech in July/August/ December 2025	SP-9	Northwestern portion	33 feet bgs	12-14	Soil probe sample above boulder refusal by Geoprobe	* TCL VOCs via EPA Method 8260 * TCL SVOCs via EPA Method 8270 * Pesticides via EPA Method 8081 * Herbicides via EPA Method 8151 * Polychlorinated biphenyls via EPA Method 8082 * TAL Metals via EPA Method 6010 & EPA Method 7471 for Mercury * Emerging Contaminants: *1,4-Dioxane via Method 8270 SIM *21 target Perfluorooctanoic acid (PFOA) via Modified EPA Method 537
	SP-10	Northeastern portion	30 feet bgs	5-7		
	SP-11	Southeastern portion	26 feet bgs	0-2	Shallow soil probe sample	
				13-15	Deepest dry Sample	
	SP-12	Southwestern portion	30 feet bgs	0-2	Shallow soil probe sample	
				7-9	Soil probe sample above boulder refusal by Geoprobe	
	SP-13	Central portion	33 feet bgs	8-10		
	SP-14	Mid-southern portion/Former tank pit	28 feet bgs	16-18		
	SP-15	Southwestern portion	34 feet bgs	0-2	Shallow soil probe sample	
				7-9	Sample above boulder refusal by Geoprobe	
	SP-16	Mid-northern portion	30 feet bgs	0-2	Shallow soil probe sample	
				8-10	Sample above boulder refusal by Geoprobe	
	SP-17	Central portion	32 ft	0-2	Shallow soil probe sample	
				12-14	Sample above boulder refusal by Geoprobe	
	SP-18	Northeastern portion	10 ft	0-10 ft	None collected	
	SP-19	Mid-northern portion	23 ft	0-23 ft		
	SP-20	Central portion	31ft	0-31 ft		

All samples were collected within the BCP site boundar
All depths are measured from the ground level
bgs…below grade surface

Summary of Groundwater Monitoring Well Sampling Locations and Analyses
3083 Webster Avenue, Bronx, NY

Investigation Phase	Monitoring Well ID	Site-Specific Location	Screen Interval (Feet bgs)	4-Inch Steel Casing Interval(Feet bgs) for Bedrock Wells	Analytical Methods
Subsurface Investigation by Tyree in October 2009	SB-1	Southeastern portion	16.5 ft	N/A	*TCL VOCs via EPA Method 8260 (CP-51 list) *TCL SVOCs via EPA Method 8270 (CP-51 list)
	SB-2	East of former tank pad	27 ft	N/A	
Post-Tank Removal Sampling by LaBella in September 2021	GW-1	Mid-southern portion	20 ft	N/A	*TCL VOCs via EPA Method 8260 *TCL SVOCs via EPA Method 8270
Remedial Investigation by HydroTech in July/August 2025 & January 2026	MW-1a(1)	Northwestern portion	17-33 ft	N/A	* TCL VOCs via EPA Method 8260 * TCL SVOCs via EPA Method 8270 * Pesticides via EPA Method 8081 * Herbicides via EPA Method 8151 * Polychlorinated biphenyls via EPA Method 8082 * TAL Metals via EPA Method 6010 & EPA Method 7471 for Mercury *1,4-dioxane via EPA Method 8270D SIM *21 target Perfluorooctanoic acid (PFOA) via Modified EPA Method 537
	MW-2a(3)	Northeastern portion	14-30 ft	0-14 (2 feet into bedrock)	
	MW-3a(2)	Southeastern portion	20-26 ft	N/A	
	MW-4a(1)	Southwestern portion	19-35 ft	N/A	
	MW-5a(1)	Central portion	17-33 ft	N/A	
	MW-6(1)	Mid-southern portion/former tank area	12-28 ft	N/A	
	MW-7(1)	Southwestern portion	18-34 ft	N/A	
	MW-8(2)	Mid-northern portion	14-30 ft	N/A	
	MW-9(2)	Central portion	16-32 ft	N/A	
	MW-10(3)	Northeastern portion (vicinity of MW-2a)	10-40 ft	0-15 (5 feet into bedrock)	* TCL VOCs via EPA Method 8260
	MW-11(3)	Mid-northern portion (vicinity of MW-8)	30-40 ft	0-30 (5 feet into bedrock)	
	MW-12(3)	Central portion (vicnity of MW-9)	36-46 ft	0-36 (5 feet into bedrock)	

bgs…below grade surface
(1)...Monitoring well screened in overburden material/weathered bedrock (WR)
(2)…Monitoring well screened in weathered/competent bedrock (WR/BR)
(3)...Monitoring well screened in competent bedrock (BR)
N/A…Not Applicable

Summary of Soil Vapor Sampling Locations and Analyses
3083 Webster Avenue, Bronx, NY

Physical Location	Soil Vapor Point ID	Specific Location	Sample Collection Depth (Feet bgs)	Sampling Time (Hours)	Analysis
Remedial Investigation by HydroTech in August 2024	SV-1	Northwestern portion	12 ft	2	VOCs and via EPA Method TO-15
	SV-2A	Mid-western portion	12 ft		
	SV-2B		6 ft		
	SV-3	Northeastern portion	12 ft		
	SV-4A	Mid-eastern portion	12 ft		
	SV-4B		6 ft		
	SV-5	Mid-southern portion/Former dispenser area	12 ft		
Remedial Investigation by HydroTech in July/August 2025	SV-1R	Northwestern portion	7 ft and 14 ft	6	
	SV-2R	Mid-western portion	6.5 ft and 13 ft		
	SV-3R	Northeastern portion	7 ft		
	SV-4R	Mid-eastern portion	6.5 ft and 13 ft		
	SV-5R	Mid-southern portion/Former dispenser area	8.5 ft and 17 ft		
	SV-6	Central portion	8 ft		
	SV-7	Mid-northern portion	5ft and 10 ft		

bgs…below grade surface

Appendix C
Estimated Remedial Costs

Tasks	**Cost of Alternative 1 Track 1**	**Cost of Alternative 2 Track 2**	**Cost of Alternative 3 Track 4**
-Waste Characterization	$55,000	$32,000	32,000
-Air Monitoring/Geologist on-site	$75,000	$55,000	55,000
-Sheeting and Shoring	$450,000	$150,000	150,000
-Dewatering	320,000	35,000	35,000
-Remedial engineering oversight	$105,000	$90,000	90,000
-Soil disposal and backfilling	$650,000	$300,000	340,000
-In-situ groundwater bioremedial treatment	20,000	80,000	80,000
-Post-excavation end-point soil samples	$20,000	$35,000	35,000
-Import of materials for truck pads and backfilling	40,000	12,000	12,000
-Project management and daily/monthly reporting	$50,000	$40,000	45,000
-Installation of cover system	-	-	55,000
-Installation of SSDS and Start-up	-	$145,000	$145,000
-Soil Vapor Intrusion Testing and Reporting	-	25,000	25,000
-Final Engineering Report	$30,000	$30,000	$30,000
-Site Management Plan	-	$20,000	$20,000
-Annual Periodic Review Reports	-	75,000	175,000
Total	$1,815,000	$1,124,000	$1,324,000

Notes :

- Listed costs include only elements of the remedy for the construction of the new building and are subject to change based on field conditions
- Listed costs are estimations and should not be followed for investment decisions
- Track 1 cleanup assumes excavation to competent bedrock across the northern portion of the Site and into native overburden material over the southern portion
- All 3 cleanup tracks consider the depth of excavation for development as stated in the RAWP
- RAWP implementation is assumed to take 3 months for Track 2 and Track 3 and 4 months for Track 1
- Dewatering under Track 1 is assumed via a pumping network into permitted municipal combined sanitary system
- Dewatering under Track 2 and Track 3 (if required) is assumed via a sump pumps system into frac tank, testing and disposal at licensed waste disposal facilities
- Annual Site Management is assumed up to 5 years for Track 2 and 10 years for Track 4

Appendix D

Citizen Participation Plan

NEW YORK STATE | Department of Environmental Conservation

Brownfield Cleanup Program

Citizen Participation Plan
for
3083 Webster Ave BCP Site

June 2025

NYSDEC Site No. C203184
3083 Webster Avenue
Bronx, NY 10467

Contents

Section	Page Number
1. What is New York's Brownfield Cleanup Program?	3
2. Citizen Participation Activities	3
3. Major Issues of Public Concern	9
4. Site Information	10
5. Investigation and Cleanup Process	11
Appendix A - Project Contacts and Locations of Reports and Information	15
Appendix B - Site Contact List	17
Appendix C - Site Location Map	27
Appendix D - Brownfield Cleanup Program Process	29

* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **6014 BCD Realty, LLC ("Applicant")**
Site Name: **3083 Webster BCP Site ("Site")**
Site Address: **3083 Webster Avenue, Bronx, NY 10467**
Site County: **Bronx**
Site Number: **C203184**

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at:
http://www.dec.ny.gov/chemical/8450.html .

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment

- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process

- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community

- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.
The site contact list includes, at a minimum:

- Chief executive officer and planning board chairperson of each county, city, town and village in which the site is located;
- Residents, owners, and occupants of the site and properties adjacent to the site;
- The public water supplier which services the area in which the site is located;
- Any person who has requested to be placed on the site contact list;
- The administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility;
- Location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site. See http://www.dec.ny.gov/chemical/61092.html .

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in Appendix A if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The

flowchart in Appendix D shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.

- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, the significant threat determination for the site had not yet been made.

To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at http://dec.ny.gov/search?text=tecnhical+assistance+grants

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Activities	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repositories	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation **Note:** Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC)	At the time the cleanup action has been completed. **Note:** The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the site. Additional major issues of public concern may be identified during the course of the site's investigation and cleanup process.

At this time, there are no known issues of public concern. Currently, the Site is vacant and is secured with a plywood fence with a locked access gate and is covered with concrete and a layer of recycled concrete aggregates in the area of the former tank field. As such, there is no traffic noise or odor impacts associated with the Site at this time. However, once the remediation commences, there may be concerns regarding odors, noise, or truck traffic coming from the site. These issues will be addressed through implementation of a Community Air Monitoring Plan (CAMP) and other Site Health and Safety Plans (HASP) designed to mitigate noise, dust, odors, and to control truck traffic and require truck tires to be cleaned before leaving the site.

The Site is located in Census Tract 425, which is designated as Disadvantaged Community / Environmental Justice Area by New York State / City.

Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities.
(For more information about environmental justice designations visit https://climate.cityofnewyork.us/topic/environmental-justice/)

The Site is located in a neighborhood with a sizable Hispanic American population; therefore, all future fact sheets will be translated into Spanish. (For more information about neighborhood demographics visithttps://statisticalatlas.com/tract/New-York/Bronx-County/042500/Race-and-Ethnicity). The surrounding neighborhood age demographics are in line with city averages. The surrounding neighborhood is connected to well-established public transportation routes to the local document repositories.

Based on the results of previous environmental investigation, contaminants consisting of gasoline and petroleum hydrocarbon (trimethylbenzene and total xylenes), semi-volatile organic compounds, and heavy metals (barium, chromium trivalent, copper, zinc) were detected in subsurface soil. Gasoline and petroleum hydrocarbons (primarily 1,2,4-trimethylbenzene, total xylenes and 1,3,5-trimethylbenzene) were detected in the underlying groundwater. Gasoline hydrocarbons (benzene, ethyl benzene, xylenes and toluene) and chlorinated hydrocarbons (primarily tetrachloroethylene) were detected in soil vapors. These chlorinated and organic vapors represent a possible public concern at the site. However, the site is not near any public water supply or private water wells. The future on-site use and remediation will not create any restrictions on community

activities but will render the Site protective of public health and the environment. An NYSDEC Community Air Monitoring Program (CAMP) is in place for the proposed remedial activities and will be followed to safeguard the workers and other adjacent occupants against any potential exposures resulting from potential contaminants known to be present in the soil, especially Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs) and metals.

4. Site Information

Site Description

3083 Webster Ave BCP Site (the "Site") is located at 3083 Webster Avenue on the north side of Webster Ave, between E Mosholu Parkway N to the west and E 204th Street to the east in Bronx, NY. The Site is 15,000-square feet and is identified on the New York City Tax Map as Block 3331 and Lot 57 on the New York City Tax Map. The Site is bordered by multiple 2 to 5 stories residential buildings to the north, west and south and to the east by Webster Avenue where a 1-story autobody repair facility and an 11-story residential building and two day-care facilities are located. One daycare facility is identified as Little Stars Childcare Program and is facing the Site from the southeast. The other facility is identified as Baby Blossoms Daycare and is located on the southern side of East 202nd Street to the east. Other potential sensitive receptors include residential facilities situated in the immediate northern, western and southern vicinities of the Site.

Surrounding properties within one half mile radius of the Site consist of residential, commercial, and vacant lands. The neighborhood is an urban medium-density residential zone and commercial district. Zoning within a 1/4-mile radius of the Site includes R5A, R6D, R7D residential zones with C1-4 and C2-4 commercial overlays.

Appendix C contains a map identifying the location of the site.

According to historic Sanborn Fire Insurance Maps and Regulatory Agency documents, the Site was developed during 1896 with a three-story building until 1900. In 1927 it was listed as auto supplies, then from 1940 to 2021 the Property was listed as an auto repair and/or service station.

Primary contaminants identified at the Site relate to historic use include gasoline-related volatile organic compounds detected in deep soil and groundwater samples (18-20 feet below sidewalk elevation) and petroleum-related polycyclic aromatic hydrocarbons were detected in shallow soil (0-2 feet below sidewalk elevation). Several volatile organic compounds were detected in the soil vapor samples. Several naturally occurring metals were detected above their unrestricted use level at various depths (0-18 feet below sidewalk elevation).

The following provides a list of reports that summarize the prior environmental assessments and investigations activities conducted at the Site. These documents were previously provided to NYSDEC and referenced in the BCP application submitted by Applicant:

- Tank Closure Report prepared by Tyree Brother's Environmental Services; Inc. (Tyree) dated May 30, 1998.
- NYSDEC correspondence dated August 12, 1998.
- Subsurface Investigation Report prepared by Tyree and dated November 1, 2009.
- Tank Closure and Remediation Excavation Report prepared by LaBella Associates, D.P.C. (Labella) and dated October 11, 2021
- Request for Spill Closure Letter issued by AG Geology D.P.C (AG) on November 12, 2021.
- Phase II Sub-Surface Investigation Report prepared by Advantage Environmental Consultants LLC (AEC) and dated January 7, 2022.
- Phase I ESA Report prepared by CA RICH Geology Services, D.P.C. (CA RICH) and dated December 27, 2023.
- Draft Remedial Investigation Report prepared by Hydro Tech Environmental Engineering and Geology, DPC (HydroTech) and dated August 29, 2024.

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination on-site, and must conduct a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in its Application proposes that the site will be used for restricted residential purposes.

To achieve this goal, the Applicant will conduct investigation and cleanup activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

Investigation

The Applicant has completed a partial site investigation before it entered into the BCP. For the partial investigation, NYSDEC will determine if the data are useable.

The Applicant will conduct an investigation of the site officially called a "remedial investigation" (RI). This investigation will be performed with NYSDEC oversight. The Applicant must develop a remedial investigation workplan, which is subject to public comment.

The site investigation has several goals:

1) Define the nature and extent of contamination in soil, surface water, groundwater and any other parts of the environment that may be affected;
2) Identify the source(s) of the contamination;
3) Assess the impact of the contamination on public health and the environment; and
4) Provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The Applicant submits a draft "Remedial Investigation Work Plan" to NYSDEC for review and approval. NYSDEC makes the draft plan available to the public review during a 30-day public comment period.

When the investigation is complete, the Applicant will prepare and submit a report that summarizes the results. This report also will recommend whether cleanup action is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site poses a significant threat to public health or the environment. If the site is a "significant threat," it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. If an IRM is likely to represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a "Remedial Work Plan". The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a final engineering report that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the final engineering report. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals

have been achieved, and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An *engineering control* is a physical barrier or method to manage contamination. Examples include caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A -
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Elliott Jackson
Project Manager
NYSDEC – Region 2
Division of Environmental Remediation
625 Broadway, Albany, NY 12233
Phone: (518) 402-9789
Email: elliott.jackson@dec.ny.gov

Thomas V. Panzone
Public Participation Specialist
Division of Communication, Education, and Engagement
NYSDEC – Region 2
47-40 21st Street
Long Island City, NY 11101
Phone: (718) 482-4953
Email: Thomas.Panzone@dec.ny.gov

New York State Department of Health (NYSDOH):
Kari Pollard
Public Health Specialist
NYSDOH
Corning Tower, Room 1787
Albany, NY, 12237
Email: beei@health.ny.gov
Phone: 518-402-7860

Locations of Reports and Information

Important project document can be found at:
https://extapps.dec.ny.gov/data/DecDocs/C203184/.

The facilities identified below are being used to provide the public with convenient access to important project documents.

New York Public Library - Mosholu
285 E 205th Street
Bronx NY 10467
Attn: Ms. Jane Addison
Phone: 718-882-8239
Email: mosholu@nypl.org
Hours:
Monday-Thursday 11 AM–7 PM
Friday-Saturday 10 AM–5 PM
Sunday CLOSED

Bronx Community Board 7
229-A East 204th Street
Bronx, NY 10458
Karla Cabrera Carrera – District Manager
Yajaira Arias, Chairperson
Betty Arce, Chairperson – Environmental & Sanitation Committee
Phone: 718-933-5650
Email: kcabreracarrera@cb.nyc.gov
Hours:
Monday-Friday 9AM-5PM
Saturday-Sunday CLOSED

Appendix B - Site Contact List

Local Elected and Government Officials

Hon. Eric Adams
NYC Mayor
City Hall
New York, NY 10007

Hon. Brad Lander
NYC Comptroller
1 Centre Street Room 517
New York, NY 1000

Hon. Jumaane D. Williams
Public Advocate
1 Centre Street 15th Floor North
New York, NY 10007

David Gold, Esq.
Commissioner, NYC Dept. of City Planning
120 Broadway, 31st Floor
New York, NY 10271

Rohit Aggarwala
Commissioner, NYC Dept. of Environmental Protection
59-17 Junction Boulevard
Flushing, NY 11373

Shaminder Chawla
Acting Director, NYC Office of Environmental Remediation
100 Gold Street - 2nd Floor
New York, NY 10038

Hon. Vanessa L. Gibson
Bronx Borough President
851 Grand Concourse, Room 301,
Bronx, NY 10451

Ischia Bravo
Bronx County Clerk
851 Grand Concourse, Room 118
Bronx, NY 10451

Hon. Charles Schumer
U.S. Senator
780 Third Avenue, Suite 2301
New York, NY 10017

Hon. Kirsten Gillibrand
U.S. Senator
780 Third Avenue, Suite 2601
New York, NY 10017

Hon. Rep. Ritchie Torres
U.S. House of Representatives
540 E Fordham Rd., Unit 2A
Bronx, NY 10458

Hon. Eric Dinowitz
NYC Councilmember
277 West 231st Street
Bronx, NY 10463

Hon. Gustavo Rivera
NYS Senator
2432 Grand Concourse, Suite 506
Bronx, NY 10458

Hon. John Zaccaro, Jr
NYS Assemblymember
2018 Williamsbridge Road
Bronx, NY 10461

Local Media Outlets:

Bronx Times
3602 East Tremont Avenue,
Bronx, NY 10465

New York Post
1211 Avenue of the Americas
New York, NY 10036

New York Daily News
4 New York Plaza
New York, NY 10004

Hoy Nueva York
Impremedia, 41 Flatbush Avenue 1st Floor
Brooklyn, NY 11201

El Diario La Prensa
Impremedia, 41 Flatbush Avenue 1st Floor Brooklyn, NY 11217

NY1 News
75 Ninth Ave
New York, NY 10011

Schneps Media
3602 East Tremont Avenue
Bronx, NY 10465

School and Daycare Facilities

P.S. 168
Principal/Executive Director/Principal https://p168x.org/
718-405-7660
3050 Webster Avenue
Bronx, NY 10467

P.S./M.S. 20 - George J. Werdann, III
Principal/Executive Director/Principal https://www.psms20bronx.org/
(718) 515-9370
3050 Webster Avenue
Bronx, NY 10467

Ediannet Daycare
Principal/Executive Director/Principal
(929) 207-8900
387 E Mosholu Pkwy N Apt.2F
Bronx, NY 10467

Little Stars Childcare Program
Principal/Executive Director/Principal
(917) 736-6737

3084 Webster Ave
Bronx, NY 10467

Baby Blossoms Daycare
Principal/Executive Director/Principal
https://babyblossomsdaycare.com/
(347)251-3153
410 E 203rd St
Bronx, NY 10467

LITTLE SUNSHINE PLAYHOUSE GROUP FAMILY DAYCARE INC
Principal/Executive Director/Principal
(646) 589-4281
3190 Rochambeau Ave,
Bronx, NY 10467

Bronx Community Charter School
Principal/Executive Director/Principal
https://www.bronxcommunity.org/
(718) 944-1400
3170 Webster Ave,
Bronx, NY 10467

X077 Bedford Park Elementary School
Principal/Executive Director/Principal
https://www.ps77x.org/apps/contact/
(718) 696-6400
3177 Webster Ave,
Bronx, NY 10467

We Care Daycare
Principal/Executive Director/Principal
(347) 819-6429
323 E Mosholu Pkwy N #1H,
Bronx, NY 10467

Dm Group Family Daycare
Principal/Executive Director/Principal
(347) 295-4203
3062 Perry Ave,
Bronx, NY 10467

Nena's group family daycare
Principal/Executive Director/Principal
(646) 316-9671
3150 Rochambeau Ave,
Bronx, NY 10467

Penelope Rodriguez Daycare
Principal/Executive Director/Principal
(646) 821-3926
155 E Mosholu Pkwy N,
Bronx, NY 10467

Playground Childcare Inc.
Principal/Executive Director/Principal
(929) 282-0123
340 E 207th St,
Bronx, NY 10467

Little Giants Childcare L.P
Principal/Executive Director/Principal
(347) 773-9906
3080 Hull Ave,
Bronx, NY 10467

Dolly's Group Family Daycare
Principal/Executive Director/Principal
(347) 902-3859
3155 Rochambeau Ave,
Bronx, NY 10467

Bright Star Day Care at Rochambeau, Inc
Principal/Executive Director/Principal
(718) 864-8922
3130 Rochambeau Ave,
Bronx, NY 10467

Norwood Kids Daycare
Principal/Executive Director/Principal
3155 Decatur Ave,
Bronx, NY 10467

Ms. P's Castle Group Family Daycare
Principal/Executive Director/Principal
(646) 964-3142
308 E 209th St,
Bronx, NY 10467

Hyattsville Daycare Inc.
Principal/Executive Director/Principal
(347) 892-2557
281 E 205th St,
Bronx, NY 10467

Ysabel’s Group Family Daycare
Principal/Executive Director/Principal
(646) 657-6520
344 E 209th St apt 3 b,
Bronx, NY 10467

Juana's group family day care
Principal/Executive Director/Principal
(917) 945-4168
3250 Perry Ave,
Bronx, NY 10467

Community, Civic, Religious and Other Environmental Organizations

Consolidated Edison Corporate Affairs
Franchesca Diaz - Director – Bronx Regional and Community Affairs
511 Theodore Fremd Avenue
Rye, NY 10580

52nd NYPD Police Precinct Council
President Brenda Caldwell
3016 Webster Ave
Bronx, NY 10467

FDNY
Engine 79/Ladder 37/Battalion 27
2928 Briggs Ave
Bronx, NY 10458

Sister Annunciata Bethell Senior Center
243 E 204th St,
Bronx, NY 10458

Bronx-Korean-Amer Senior Citizen
2943 Bainbridge Ave,
Bronx, NY 10458

World Mission Society Church of God
3119 Webster Ave Unit 2B,
Bronx, NY 10467

Second Mission Jerusalem
3138 Webster Ave,
Bronx, NY 10467

Christ Disciples International Ministries - Food Distribution Center
3021 Webster Ave,
Bronx, NY 10467

Christ Disciples Int'l Ministries, Inc.
399 Mosholu Pkwy,
Bronx, NY 10467

2da Iglesia Pentecostal Luz En Medio De Las Tinieblas Inc.
3037 Webster Ave,
Bronx, NY 10467

Holy Nativity Episcopal Church
3061 Bainbridge Ave,
Bronx, NY 10467

CENTRO DE ADORACION IMPACTO DIVINO - CAID
3037 Webster Ave,
Bronx, NY 10467

Iglesia Adventista del Séptimo Día Hispana de Fordham / Fordham Spanish Seventh-Day Adventist Church
3158 Webster Ave,
Bronx, NY 10467

Iglesia Casa de mi Padre
281 E 204th St,
Bronx, NY 10467

Lutheran Church of the Epiphany
3127 Decatur Ave,
Bronx, NY 10467

Bedford Park Seventh-day Adventist Church
3008 Bainbridge Ave,
Bronx, NY 10458

The Ethiopian Orthodox Tewahedo Church of Our Savior, Inc.
302 E 206th St,
Bronx, NY 10467

The Bedford Park Presbyterian Church
2943 Bainbridge Ave,
Bronx, NY 10458

North Bronx Islamic Center
261 E 206th St,
Bronx, NY 10467

Masjidus Sabur
2975 Bainbridge Ave,
Bronx, NY 10458

Adjacent Properties

3074 Webster Avenue Holding Corp.
3074 Webster Avenue
Bronx, NY 10467

3077 Webster LLC
250 Gristmill Lane
Great Neck, NY 11023

Anthony Omoruan / Theresa Omoruan
3080 Decatur Avenue
Bronx, NY 10467

Cynthia Figueroa
3082 Decatur Avenue
Bronx, NY 10467

Mohammed Alam
246 E 207th Street, 2nd Floor
Bronx, NY 10467

HP Norwood Gardens Housing Development Fund, Co.
242 West 36th Street, 3rd Floor
New York, NY 10018

Mohammed K. Ahmed / Mohammed N. Islam
3086 Decatur Avenue
Bronx, NY 10467

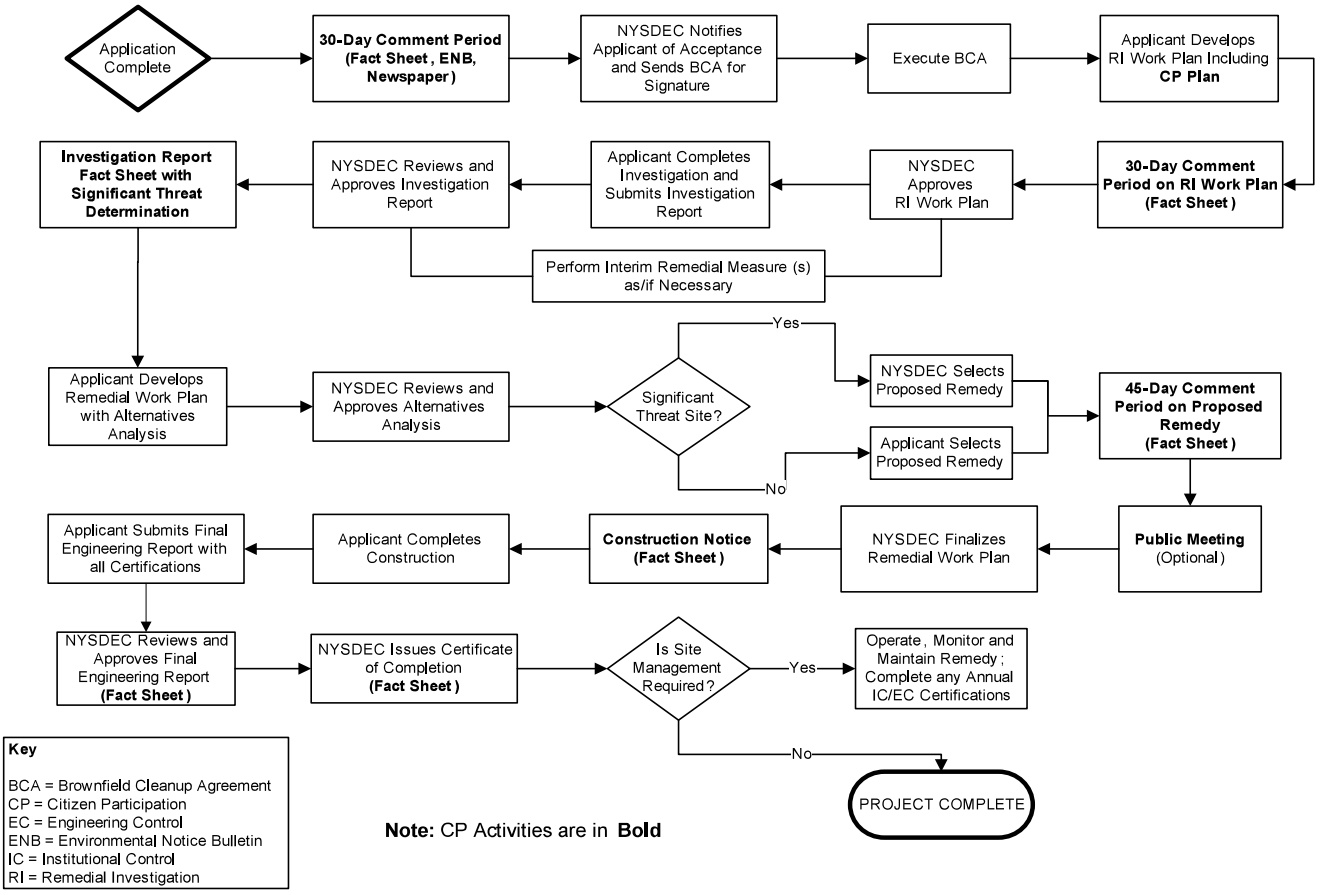
Jeanne Cuffy / Kenneth Cuffy
3090 Decatur Avenue
Bronx, NY 10467

Tinton Management LLC
4910 13th Avenue
Brooklyn, NY 11219

Appendix C - Site Location Map

FIGURE 1: SITE LOCATION MAP

Appendix D– Brownfield Cleanup Program Process



Key

BCA = Brownfield Cleanup Agreement
CP = Citizen Participation
EC = Engineering Control
ENB = Environmental Notice Bulletin
IC = Institutional Control
RI = Remedial Investigation

Note: CP Activities are in **Bold**

Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern

Instructions

This Scoping Sheet assesses major issues of public concern; impacts of the site and its remedial program on the community; community interest in the site; information the public needs; and information needed from the public.

The information generated helps to plan and conduct required citizen participation (CP) activities, and to choose and conduct additional CP activities, if appropriate. The scoping sheet can be revisited and updated as appropriate during the site's remedial process to more effectively implement the site's CP program.

Note: Use the information as an aid to prepare and update the Major Issues of Public Concern section of the site CP Plan.

General Instructions

- When to prepare: During preparation of the CP Plan for the site. It can be revisited and updated anytime during the site remedial process.
- Fill in site name and other information as appropriate.
- The Scoping Sheet may be prepared by DEC or a remedial party, but must be reviewed and approved by the DER site project manager or his/her designee.

Instructions for Numbered Parts

Consider the bulleted issues and questions below and any others that may be unique or appropriate to the site and the community to help complete the five Parts of this Scoping Sheet. Identify the issue stakeholders in Parts 1 through 3 and adjust the site's contact list accordingly.

Part 1. List Major Issues of Public Concern and Information the Community Wants.

- Is our health being impacted? (e.g. Are there problems with our drinking water or air? Are you going to test our water, yards, sumps, basements? Have health studies been done?)
- There are odors in the neighborhood. Do they come from the site and are they hazardous?
- Are there restrictions on what we may do (e.g. Can our children play outside? Can we garden? Must we avoid certain areas? Can we recreate (fish, hunt, hike, etc. on/around the site?)
- How and when were the site's contamination problems created?
- What contaminants are of concern and why? How will you look for contamination and find out where it is going? What is the schedule for doing that?
- The site is affecting our property values!
- How can we get more information (e.g. who are the project contacts?)
- How will we be kept informed and involved during the site remedial process?
- Who has been contacted in the community about site remedial activities?

- What has been done to this point? What happens next and when?
- The site is going to be cleaned up for restricted use. What does that mean? We don't want redevelopment on a "dirty" site.

Part 2. List Important Information Needed From the Community, if Applicable.

- Can the community supplement knowledge about past/current uses of the site?
- Does the community have knowledge that the site may be significantly impacting nearby people, properties, natural resources, etc.?
- Are activities currently taking place at the site or at nearby properties that may need to be restricted?
- Who may be interested or affected by the site that has not yet been identified?
- Are there unique community characteristics that could affect how information is exchanged?
- Does the community and/or individuals have any concerns they want monitored?
- Does the community have information about other sources in the area for the contamination?

Part 3. List Major Issues and Information That Need to be Communicated to the Community.

- Specific site investigation or remediation activities currently underway, or that will begin in the near future.
- The process and general schedule to investigate, remediate and, if applicable, redevelop the site.
- Current understanding about the site contamination and effects, if any, on public health and the environment.
- Site impacts on the community and any restrictions on the public's use of the site and/or nearby properties.
- Planned CP activities, their schedule, and how they relate to the site's remedial process.
- Ways for the community to obtain/provide information (document repositories, contacts, etc.).

Part 4. Community Characteristics

a. - e. Obtain information from local officials, property owners and residents, site reports, site visits, "windshield surveys," other staff, etc.

f. Has the affected community experienced other **significant** present or past environmental problems unrelated to this site? Such experiences could significantly affect public concerns and perspectives about the site; how the community will relate to project staff; the image and credibility of project staff within the community; and the ways in which project staff communicate with the community.

g. In its remedial programs, DER seeks to integrate, and be consistent with, environmental justice principles set forth in *DEC Commissioner Policy 29 on Environmental Justice* and *DER 23 – Citizen Participation Handbook for Remedial Programs*. Is the site and/or affected community wholly or partly in an Environmental Justice (EJ) Area? Use the Search feature on DEC's public web site for "environmental justice". DEC's EJ pages define an EJ area, and link to county maps to help determine if the site and/or community are in an EJ area.

h. Consider factors such as:

- Is English the primary language of the affected community? If not, provisions should be considered regarding public outreach activities such as fact sheets, meetings, door-to-door visits and other activities to ensure their effectiveness.
- The age demographics of the community. For example, is there a significant number of senior citizens in the community? It may be difficult for some to attend public meetings and use document repositories. This may suggest adopting more direct interaction with the community with activities such as door-to-door visits, additional fact sheets, visits to community and church centers, nursing homes, etc.

- How do people travel about the community? Would most people drive to a public meeting or document repository? Is there adequate public transportation?

Part 5. Affected/Interested Public.

Individuals and organizations who need or want information and input can change during the site's remedial process. This need is influenced by real, potential, or perceived impacts of the site or the remedial process. Some people may want information and input throughout the remedial process. Others may participate only during specific remedial stages, or may only be interested in particular issues.

It is important to revisit this question when reviewing this scoping sheet. Knowing who is interested in the site – and the issues that are important to them – will help to select and conduct appropriate outreach activities, and to identify their timing and the information to be exchanged.

Check all affected/interested parties that apply to the site. **Note: Adjust the site's contact list appropriately.** The following are some ways to identify affected/interested parties:

- Tax maps of adjacent property owners
- Attendees at public meetings
- Telephone discussions
- Letters and e-mails to DER, the remedial party, and other agencies
- Political jurisdictions and boundaries
- Media coverage
- Current/proposed uses of site and/or nearby properties (recreational, commercial, industrial)
- Discussions with community organizations: grass roots organizations, local environmental groups, environmental justice groups, churches, and neighborhood advisory groups

Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern (see instructions)

Site Name: 3083 Webster Ave BCP Site

Site Number: C203184

Site Address and County: 3083 Webster Ave, Bronx

Remedial Party(ies): 6014 BCD Realty, LLC

Note: For Parts 1. – 3. the individuals, groups, organizations, businesses and units of government identified should be added to the site contact list as appropriate.

Part 1. List major issues of public concern and information the community wants. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and information needs. **Use this information as an aid to prepare or update the Major Issues of Public Concern section of the site Citizen Participation Plan.**
The site is also located within a NYS Environmental (EN) Zone (Census Tract 425) and also within a disadvantaged community with a sizable Hispanic American population. Therefore, all future fact sheets will be translated into Spanish.

How were these issues and/or information needs identified?
NA

Part 2. List important information needed **from** the community, if applicable. Identify individuals, groups, organizations, businesses and/or units of government related to the information needed.
NA

How were these information needs identified?
NA

Part 3. List major issues and information that need to be communicated **to** the community. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and/or information.
NA

How were these issues and/or information needs identified?
NA

Part 4. Identify the following characteristics of the affected/interested community. This knowledge will help to identify and understand issues and information important to the community, and ways to effectively develop and implement the site citizen participation plan (mark all that apply):

a. Land use/zoning at and around site:
☒ **Residential** ☐ **Agricultural** ☐ **Recreational** ☐ **Commercial** ☐ **Industrial**

b. Residential type around site:

☒ **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:
☒ **High** ☐ **Medium** ☐ **Low**

d. Water supply of nearby residences:
☒ **Public** ☐ **Private Wells** ☐ **Mixed**

e. Is part or all of the water supply of the affected/interested community currently impacted by the site?
☐ **Yes** ☒ **No**

Provide details if appropriate:
Click here to enter text.

f. Other environmental issues significantly impacted/impacting the affected community?
☐ **Yes** ☒ **No**

Provide details if appropriate:
Click here to enter text.

g. Is the site and/or the affected/interested community wholly or partly in an Environmental Justice Area?
☒ **Yes** ☐ **No**

h. Special considerations:
☒ **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**

Explain any marked categories in **h:**
The Site is located in a neighborhood with a sizable Hispanic American population.

Part 5. The site contact list must include, at a minimum, the individuals, groups, and organizations identified in Part 2. of the Citizen Participation Plan under 'Site Contact List'. Are *other* individuals, groups, organizations, and units of government affected by, or interested in, the site, or its remedial program? (Mark and identify all that apply, then adjust the site contact list as appropriate.)

☒ **Non-Adjacent Residents/Property Owners:** Click here to enter text.

☒ **Local Officials:** Click here to enter text.

☒ **Media:** Click here to enter text.

☒ **Business/Commercial Interests:** Click here to enter text.

☐ **Labor Group(s)/Employees:** Click here to enter text.

☐ **Indian Nation:** Click here to enter text.

☒ **Citizens/Community Group(s):** Click here to enter text.

☒ **Environmental Justice Group(s):** Click here to enter text.

☒ **Environmental Group(s):** Click here to enter text.

☒ **Civic Group(s):** Click here to enter text.

☐ **Recreational Group(s):** Click here to enter text.

☐ **Other(s):** Click here to enter text.

Prepared/Updated By: Paul I. Matli **Date:** 3/12/2025

Reviewed/Approved By: Thomas V. Panzone **Date:** 4-21-25

Appendix E

Environmental Footprint Analysis and Climate Screening Checklist

Climate Screening Checklist

Background Information

- Project Manager: Elliott Jackson, NYSDEC Project Manager
- Site Name: 3083 Webster Ave BCP Site
- Site Number: C203184
- Site Location: 3083 Webster Avenue, Bronx, NY
- Site Elevation (average above sea level): 86 ft el.
- ClimAID Region (Responding Climate Change in New York State (ClimAID) - NYSERDA): Region 2--New York City and Long Island
- Remedial Stage/site classification: Implementation of Remedial Action

- Contamination - Media Impacted/ Contaminants of Concern:
  Soil (gasoline VOCs, PAHs, and metals, PFOA) , Vapor Intrusion and Groundwater (gasoline VOCs, CVOCs i.e., PCE, TCE, cis-1,2-DCE, PFOA, PFOS)
- Proposed/Current Remedy:
  Active SSDS, composite cover system, vapor barrier system

- What is the predicted timeframe of the remedy? Will components of the remedy still be in place in 10+ years? No, potential conversion of the SSDS to passive system after 5 years of operation
  The predicted time frame is 50+ years. Components of the remedy will still be in place in 5+ years.
  Yes
- Is the site in proximity to any sensitive receptors? (e.g. wetlands, waterbodies, residential properties, hospitals, schools, drinking water supplies, etc.)
  Yes, two daycare facilities are located across the southern vicinity of the BCP Site

Is the site in a disadvantaged community (DAC) or potential environmental justice area (PEJA) (Use DECinfolocator: DECinfo Locator (ny.gov))?

Yes, DAC and PEJA

☒ **Yes** ☐ **No**

If the site is in a DAC or PEJA, will climate impacts be magnified? If yes, list how and why.

☐ **Yes** ☒ **No**

Should thresholds of concern be lowered to account for magnification of impacts? If yes, indicate how lower thresholds will be used in the screening.

☐ **Yes** ☒ **No**

Climate Screening Table*

Potential Climate Hazards	**Relevant to the Site Location** (Y/N/NA)[1]	**Projected Change** (Reference data source/Model)[3]	**Potential to Impact Remedy** (Y/N)	**Is remedy/site already resilient?** (Y/N)[4]
Precipitation	NA	N/A	N/A	Y - SWPPP controls
Temperature[2] (Extreme Heat or Cold Weather Impacts)	Y	N - ClimAID report	N/A	Y- Construction HASP controls
Sea Level Rise	N/A	N/A		
Flooding	N/A	N		
Storm Surge	N/A	N/A		
Wildfire	N/A	N/A		
Drought	N/A	N		
Storm Severity	Y	Y - RAPT/ ArcGIS		Y - SWPPP controls
Landslides	N/A			
Other Hazards:	N/A			

* Links to potential data sources can be found on the following page

[1] If the first column is N --> The rest of the columns will be N/A, the hazard is not applicable to the site.

[2] Extreme Heat: periods of three or more days above 90°F- Extreme Cold: Individual days with minimum temperatures at or below 0 degrees F (NYSERDA ClimAID report)

[3] List the projected change in specific terms or units e.g. inches of rain fall, feet of sea level rise, etc.

[4] If final column is Y, provide reasoning, if the final column is N --> Climate Vulnerability Assessment (CVA) required.

Required Next Steps (If no further action is required, provide justification):

No Further Action. Remedial construction at the BCP Site will be subject to strict site controls and site safety measures governed by the New York City Department of Buildings.

Potential Data Sources (not an exhaustive list)- from Superfund Climate Resilience: Vulnerability Assessment | US EPA

NYSERDA ClimAID report- Responding Climate Change in New York State (ClimAID) - NYSERDA

FEMA- National Flood Hazard Layer | FEMA.gov

NOAA- National Storm Surge Risk Maps - Version 3 (noaa.gov)

Department of Agriculture Forest Service Wildfire Risk to Communities

EPA Climate Change Indicators in the United States

EPA Climate Resilience Evaluation & Awareness Tool (CREAT) | U.S. Climate Resilience Toolkit

EPA National Stormwater Calculator

National Integrated Drought Information System U.S. Drought Portal

National Interagency Coordination Center National Interagency Fire Center

National Oceanic and Atmospheric Administration Coastal Services Digital Coast

- Resources to help communities assess coastal hazards, such as the Sea Level Rise Viewer for visualizing community-level impacts of flooding or sea level rise and downloadable LIDAR data

National Oceanic and Atmospheric Administration National Centers for Environmental Information website

National Oceanic and Atmospheric Administration Sea Level Trends

National Weather Service Climate Prediction Center

National Weather Service National Hurricane Center

National Weather Service Sea, Lake, and Overland Surges from Hurricanes (SLOSH)

National Weather Service Storm Surge Hazard Maps

U.S. Federal Government Climate Resilience Toolkit: The Climate Explorer

U.S. Army Corps of Engineers Climate Prepardness and Resilience

U.S. Geological Survey Coastal Change Hazards Portal

U.S. Geological Survey Landslide Hazards Program

U.S. Geological Survey National Ground-water Monitoring Network Data Portal

U.S. Geological Survey National Climate Change Viewer

U.S. Geological Survey National Water Dashboard

U.S. Geological Survey StreamStats

NYS Department of State- Assess | Department of State (ny.gov)

NYSERDA NY Costal Floodplain Mapper- Home Page (ny.gov)

NYSDEC Costal Erosion Hazards- Coastal Areas Regulated By The CEHA Permit Program - NYDEC

NYSDOH Heat Index- health.ny.gov/environmental/weather/vulnerability_index/county_maps.htm

GSR Summary

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
3083 Webster Ave - <Track 1>

Environmental Footprint Summary

Core Element	Metric		Unit of Measure	Footprint						
				Demolition	Soil Excavation including air monitoring	SSDS and Vapor Barrier	Consutruction (Building foundation)	Groundwater Injection	Sampling	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-2	% of refined materials from recycled or reused material	%							
	M&W-3	Unrefined materials used on-site	Tons	0.000	8,740.000	2.050	415.000	0.500	0.000	9,157.6
	M&W-4	% of unrefined materials from recycled or reused material	%		0.0%	0.0%	0.0%	0.0%		0.0%
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	8,400.0	8,620.0	0.0	0.0	0.0	0.0	17,020.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%	0.0%	0.0%					0.0%
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	2,226.2	8,512.0	70.7	3,221.9	30.5	0.0	14,061.2
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.000	0.500	0.000	0.000	0.000	0.000	0.5
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	37.5	1,408.1	0.0	321.8	16.1	0.0	1,783.5
	A-2	On-site HAP emissions	Pounds	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	A-3	Total NOx, SOx, and PM emissions	Pounds	6,250.7	13,150.6	25.8	4,238.4	29.2	0.0	23,694.6
	A-3A	Total NOx emissions	Pounds	2,166.2	7,503.2	16.9	1,872.6	20.4	0.0	11,579.3
	A-3B	Total SOx emissions	Pounds	695.6	1,769.5	7.8	1,728.1	7.7	0.0	4,208.7
	A-3C	Total PM emissions	Pounds	3,388.9	3,877.9	1.1	637.7	1.1	0.0	7,906.7
	A-4	Total HAP emissions	Pounds	18.0	81.1	0.5	151.3	0.1	0.0	251.1
	A-5	Total greenhouse gas emissions	Tons CO2e*	177.2	752.7	2.8	198.8	2.1	0.0	1,133.5
Land & Ecosystems	Qualitative Description									

** Total greenhouse gases emissions (in CO2e) include consideration of CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)

The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

Notes:

GSR Summary

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
3083 Webster Ave - <Track 1>

Demolition - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**29**	**4,725**	**36**	**1**	**1**	**38**	**0**
Grid Electricity Generation (Scope 2)	**0.000**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**757**	**122,510**	**926**	**29**	**19**	**974**	**0**
Other Off-Site (Scope 3b)	**1,440**	**227,088**	**1,205**	**665**	**3,370**	**5,240**	**18**
Remedy Totals	**2,226**	**354,323**	**2,166**	**696**	**3,389**	**6,251**	**18**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity
On-site renewable energy generation or use	MMBtu	**0**
On-site biodiesel use	MMBtu	**0**
Biodiesel and other renewable resource use for transportation	MMBtu	**0**
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**
Voluntary purchase of renewable electricity	MWh	**0**
Voluntary purchase of RECs	MWh	**0**

(This value is the sum of the three rows above)

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
3083 Webster Ave - <Track 1>

Soil Excavation including air monitoring - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**1,096**	**177,188**	**1,339**	**43**	**27**	**1,408**	**0**
Grid Electricity Generation (Scope 2)	**3**	**176**	**1**	**1**	**0**	**2**	**0**
Transportation (Scope 3a)	**3,310**	**535,802**	**3,928**	**125**	**81**	**4,133**	**2**
Other Off-Site (Scope 3b)	**4,102**	**792,303**	**2,236**	**1,602**	**3,770**	**7,608**	**79**
Remedy Totals	**8,512**	**1,505,469**	**7,503**	**1,770**	**3,878**	**13,151**	**81**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity
On-site renewable energy generation or use	MMBtu	**0**
On-site biodiesel use	MMBtu	**0**
Biodiesel and other renewable resource use for transportation	MMBtu	**0**
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**
Voluntary purchase of renewable electricity	MWh	**0**
Voluntary purchase of RECs	MWh	**0**

(This value is the sum of the three rows above)

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Consutruction (Building foundation) - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**250**	**40,500**	**306**	**10**	**6**	**322**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**373**	**60,446**	**457**	**15**	**9**	**480**	**0**
Other Off-Site (Scope 3b)	**2,598**	**296,559**	**1,110**	**1,704**	**622**	**3,436**	**151**
Remedy Totals	**3,222**	**397,505**	**1,873**	**1,728**	**638**	**4,238**	**151**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
3083 Webster Ave - <Track 1>

SSDS and Vapor Barrier - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**7**	**1,190**	**9**	**0**	**0**	**9**	**0**
Other Off-Site (Scope 3b)	**63**	**4,323**	**8**	**8**	**1**	**16**	**1**
Remedy Totals	**71**	**5,513**	**17**	**8**	**1**	**26**	**1**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity
On-site renewable energy generation or use	MMBtu	**0**
On-site biodiesel use	MMBtu	**0**
Biodiesel and other renewable resource use for transportation	MMBtu	**0**
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**
Voluntary purchase of renewable electricity	MWh	**0**
Voluntary purchase of RECs	MWh	**0**

(This value is the sum of the three rows above)

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Groundwater Injection - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**13**	**2,025**	**15**	**0**	**0**	**16**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**1**	**205**	**2**	**0**	**0**	**2**	**0**
Other Off-Site (Scope 3b)	**17**	**1,979**	**4**	**7**	**1**	**11**	**0**
Remedy Totals	**30**	**4,209**	**20**	**8**	**1**	**29**	**0**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Sampling - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Off-Site (Scope 3b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Remedy Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

All - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**1,388**	**224,438**	**1,696**	**54**	**34**	**1,784**	**0**
Grid Electricity Generation (Scope 2)	**3.463**	**176**	**1**	**1**	**0**	**2**	**0**
Transportation (Scope 3a)	**4,449**	**720,153**	**5,321**	**169**	**109**	**5,598**	**2**
Other Off-Site (Scope 3b)	**8,221**	**1,322,235**	**4,562**	**3,985**	**7,764**	**16,311**	**249**
Remedy Totals	**14,061**	**2,267,001**	**11,579**	**4,209**	**7,907**	**23,694**	**251**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity
On-site renewable energy generation or use	MMBtu	**0**
On-site biodiesel use	MMBtu	**0**
Biodiesel and other renewable resource use for transportation	MMBtu	**0**
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**
Voluntary purchase of renewable electricity	MWh	**0**
Voluntary purchase of RECs	MWh	**0**

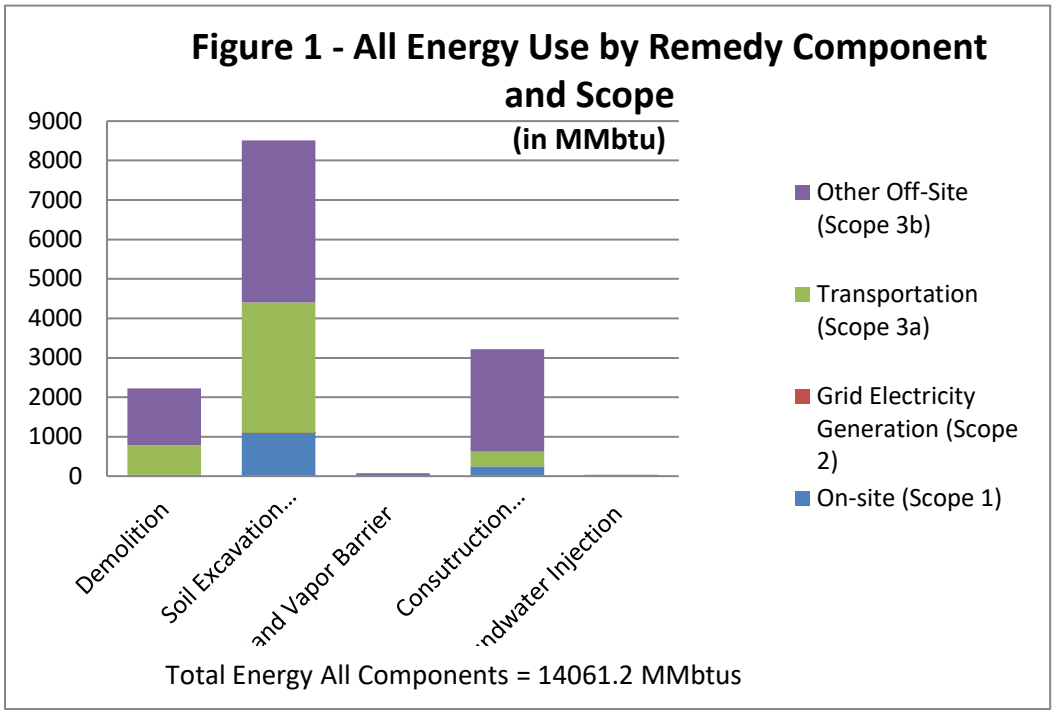
(This value is the sum of the three rows above)

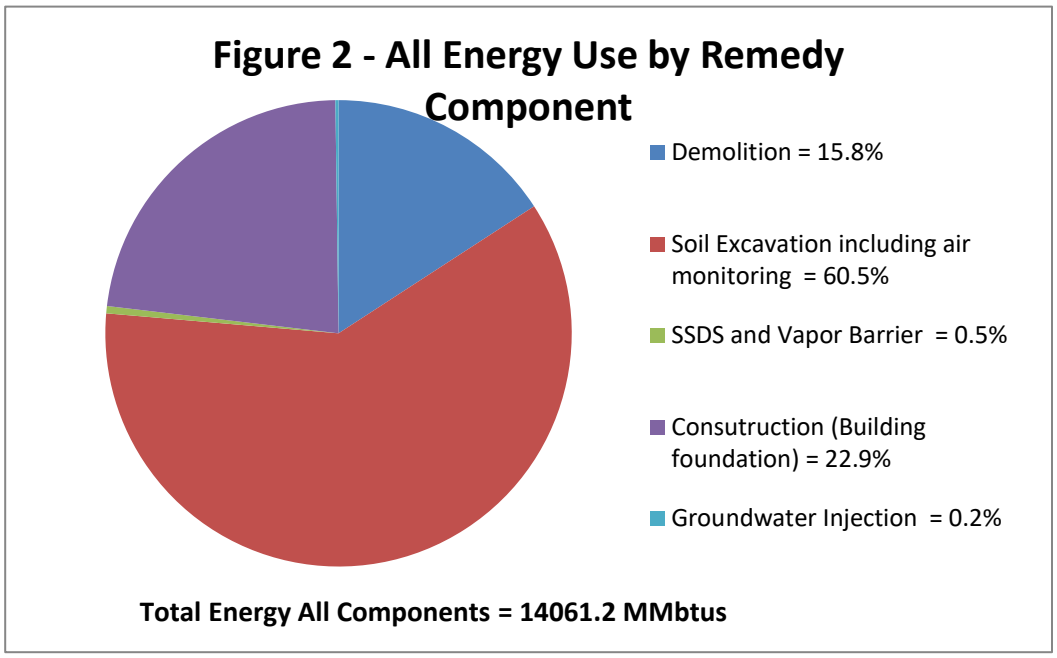
This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

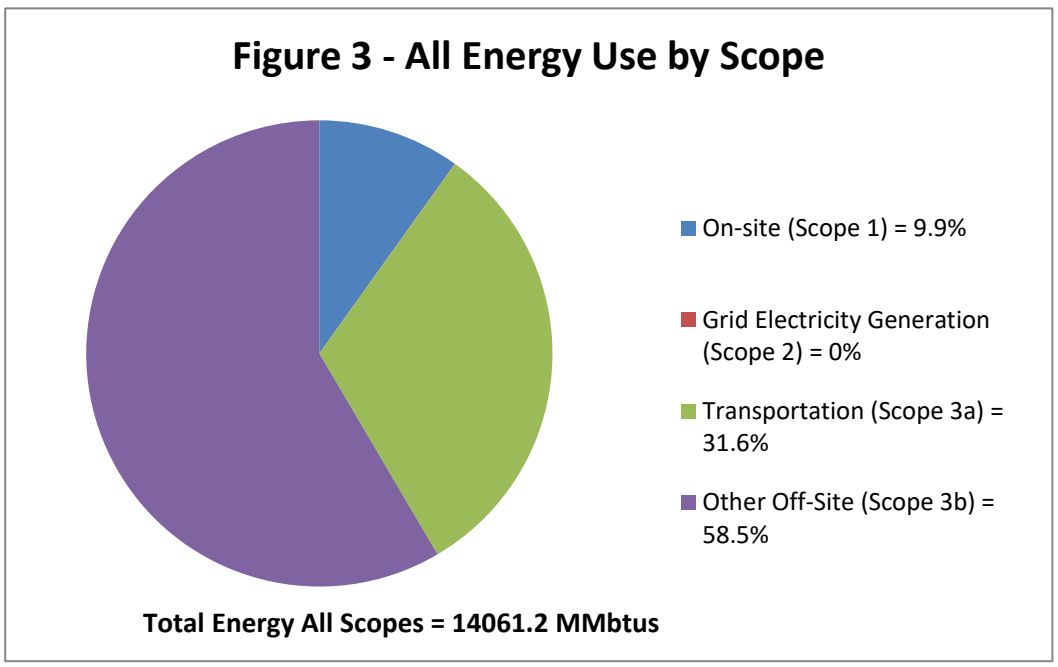
GSR Summary

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019

3083 Webster Ave - <Track 1>







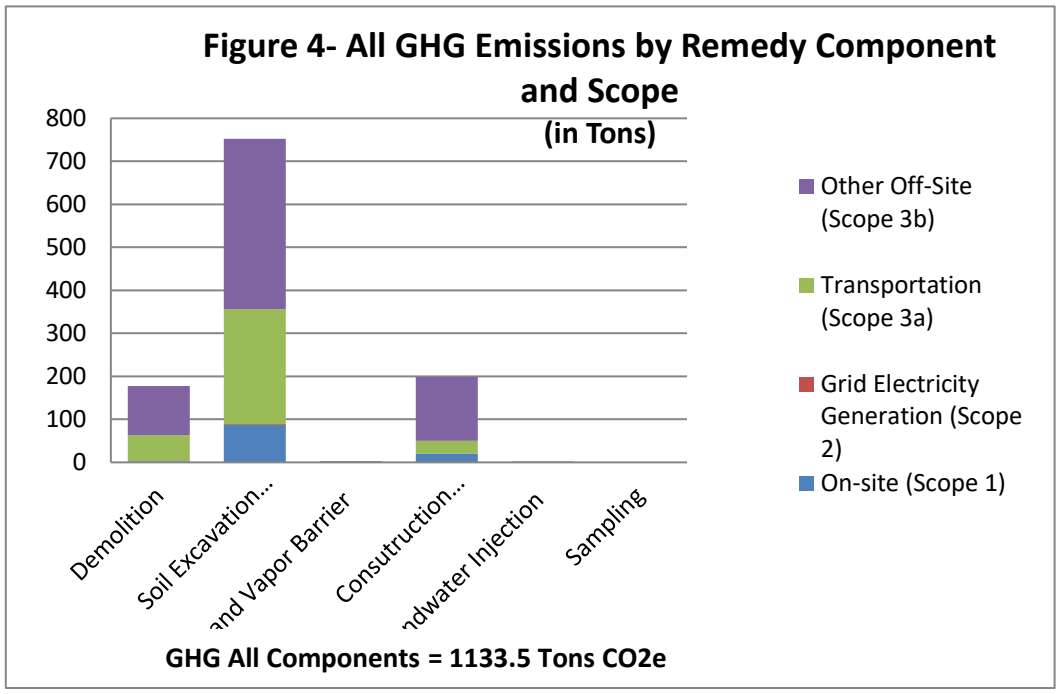


Figure 4- All GHG Emissions by Remedy Component and Scope (in Tons)
800
700
600
500
400
300
200
100
0
Demolition
Soil Excavation...
and Vapor Barrier
Consutruction...
ndwater Injection
Sampling
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 1133.5 Tons CO2e

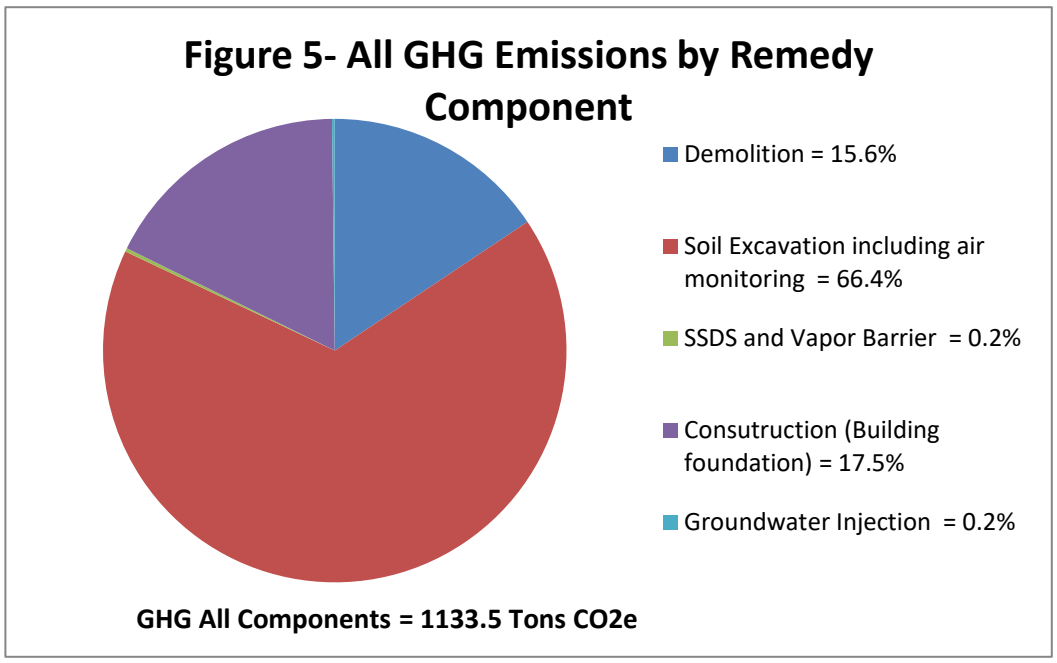


Figure 5- All GHG Emissions by Remedy Component
Demolition = 15.6%
Soil Excavation including air monitoring = 66.4%
SSDS and Vapor Barrier = 0.2%
Consutruction (Building foundation) = 17.5%
Groundwater Injection = 0.2%
GHG All Components = 1133.5 Tons CO2e

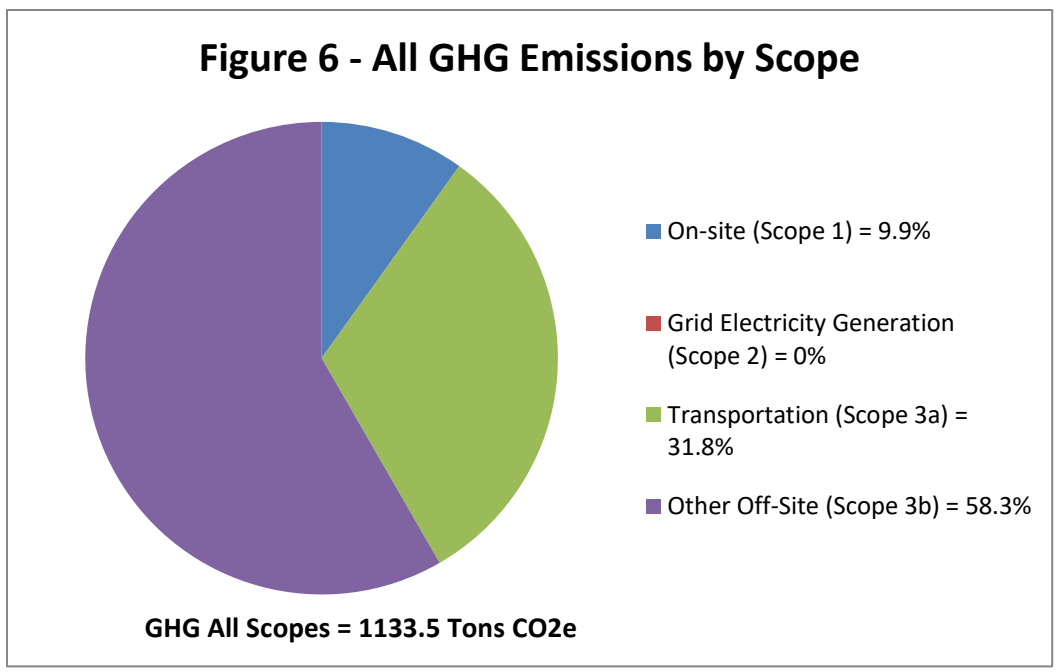


Figure 6 - All GHG Emissions by Scope
On-site (Scope 1) = 9.9%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 31.8%
Other Off-Site (Scope 3b) = 58.3%
GHG All Scopes = 1133.5 Tons CO2e

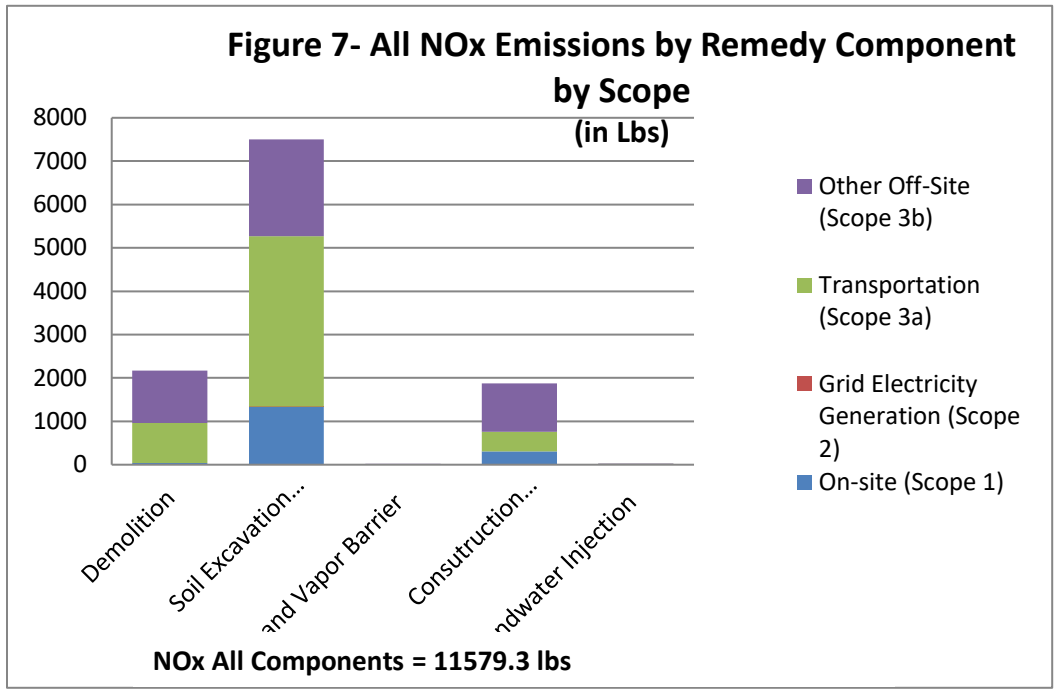


Figure 7- All NOx Emissions by Remedy Component by Scope (in Lbs)
8000
7000
6000
5000
4000
3000
2000
1000
0
Demolition
Soil Excavation...
and Vapor Barrier
Consutruction...
ndwater Injection
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 11579.3 lbs

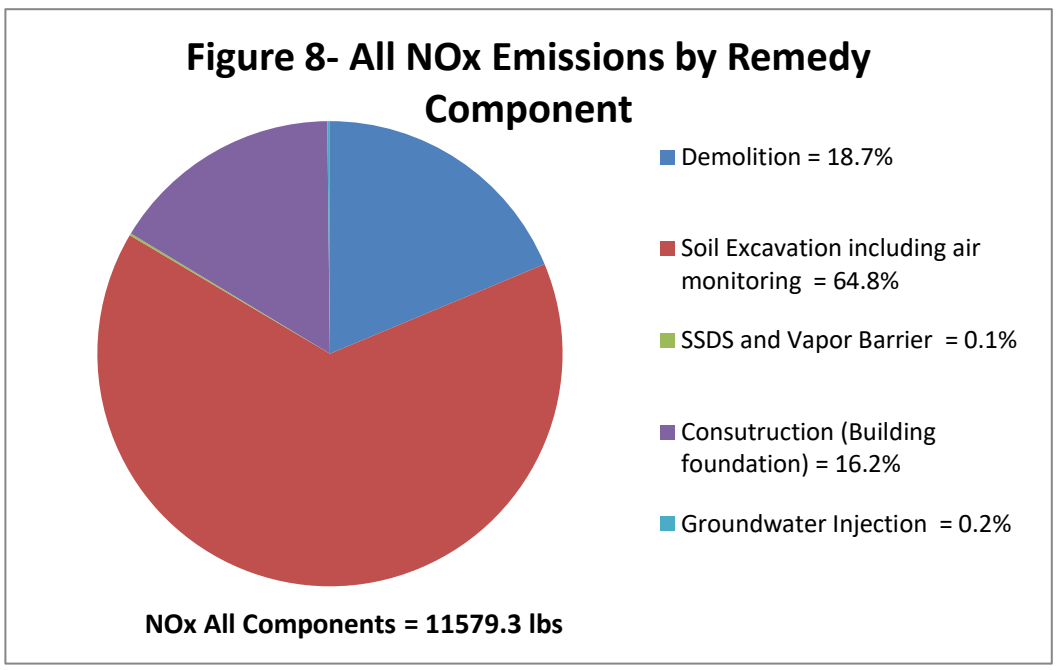


Figure 8- All NOx Emissions by Remedy Component
Demolition = 18.7%
Soil Excavation including air monitoring = 64.8%
SSDS and Vapor Barrier = 0.1%
Consutruction (Building foundation) = 16.2%
Groundwater Injection = 0.2%
NOx All Components = 11579.3 lbs

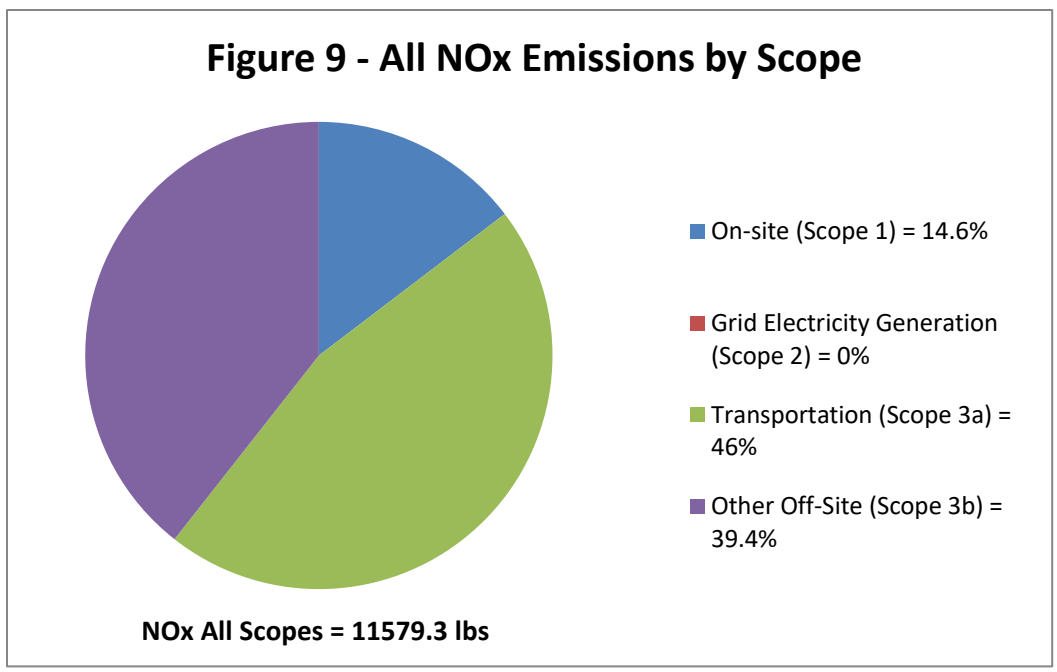


Figure 9 - All NOx Emissions by Scope
On-site (Scope 1) = 14.6%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 46%
Other Off-Site (Scope 3b) = 39.4%
NOx All Scopes = 11579.3 lbs

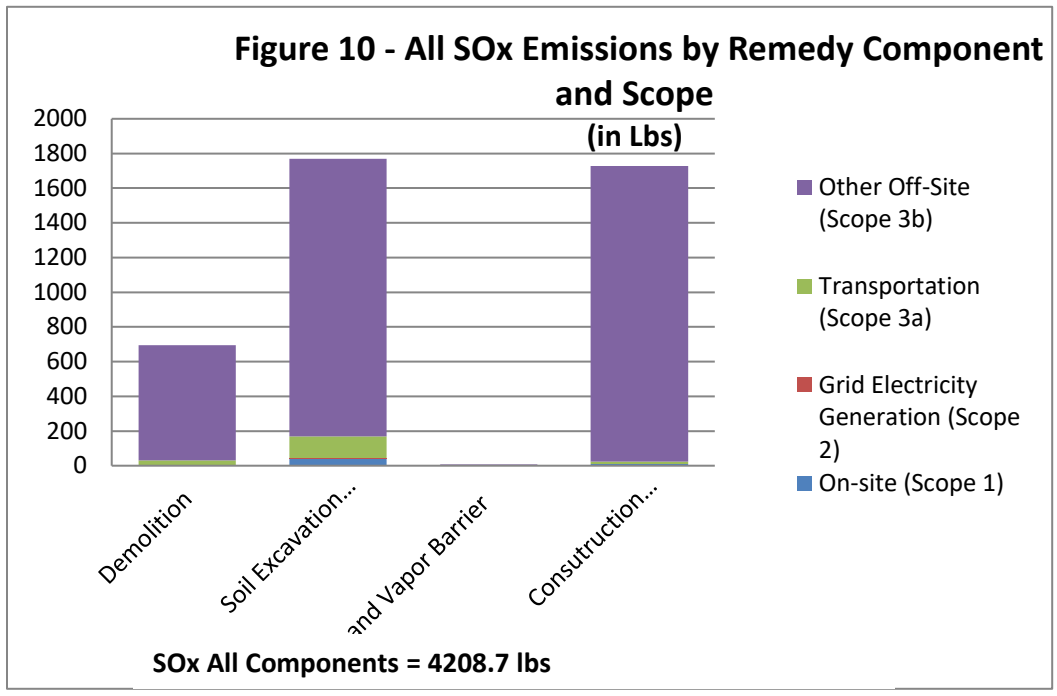


Figure 10 - All SOx Emissions by Remedy Component and Scope
(in Lbs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Demolition
Soil Excavation...
and Vapor Barrier
Consutruction...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 4208.7 lbs

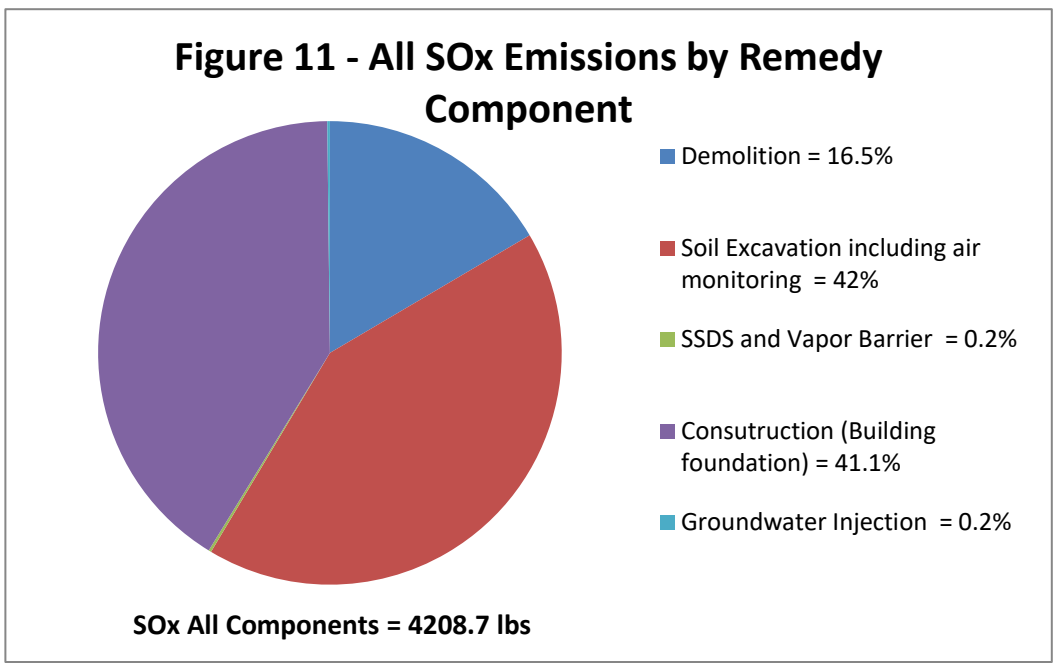


Figure 11 - All SOx Emissions by Remedy Component
Demolition = 16.5%
Soil Excavation including air monitoring = 42%
SSDS and Vapor Barrier = 0.2%
Consutruction (Building foundation) = 41.1%
Groundwater Injection = 0.2%
SOx All Components = 4208.7 lbs

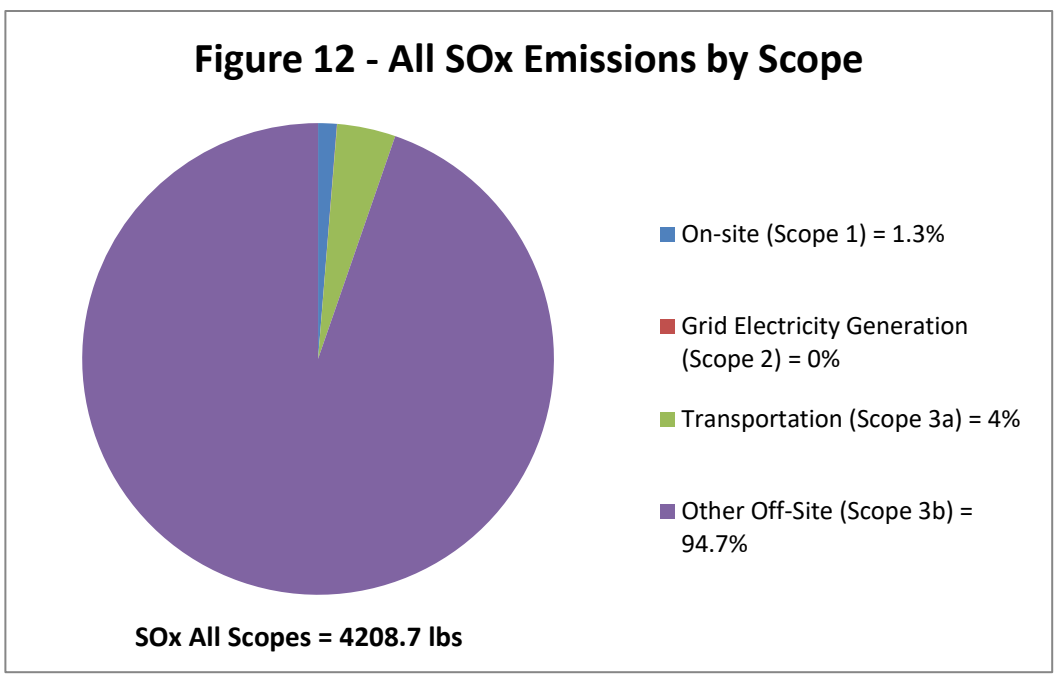


Figure 12 - All SOx Emissions by Scope
On-site (Scope 1) = 1.3%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 4%
Other Off-Site (Scope 3b) = 94.7%
SOx All Scopes = 4208.7 lbs

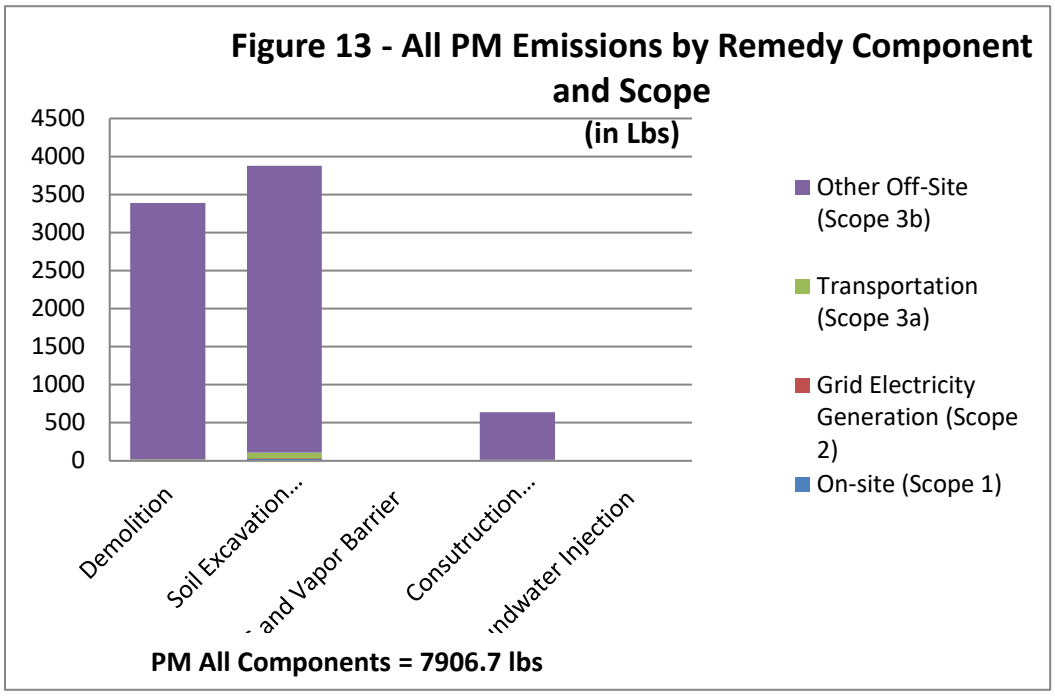


Figure 13 - All PM Emissions by Remedy Component and Scope
(in Lbs)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Demolition
Soil Excavation...
and Vapor Barrier
Consutruction...
ndwater Injection
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 7906.7 lbs

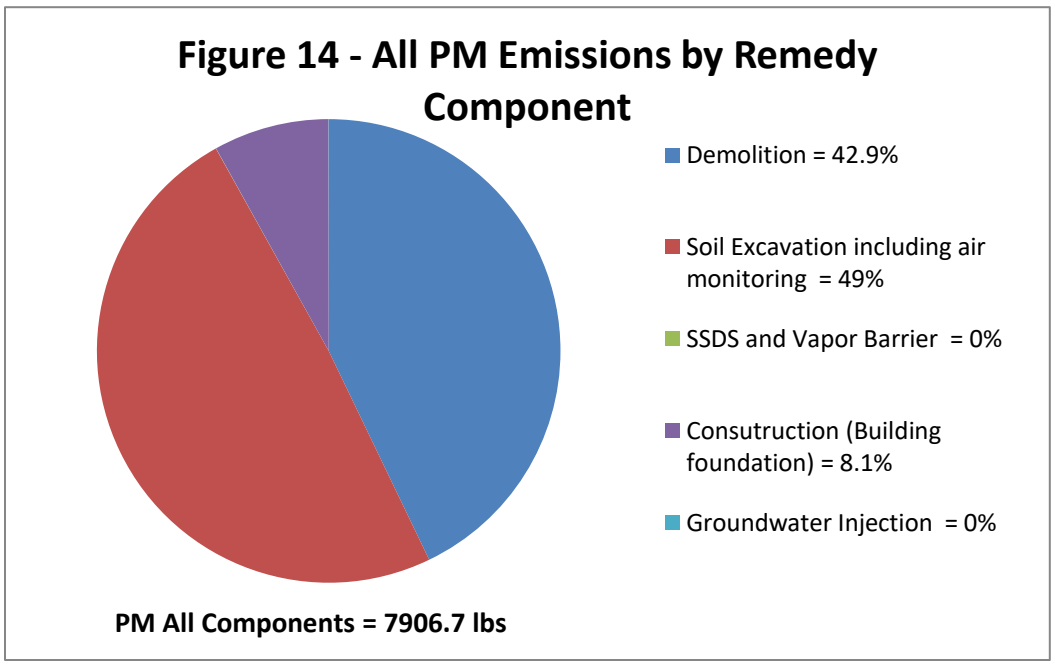


Figure 14 - All PM Emissions by Remedy Component
Demolition = 42.9%
Soil Excavation including air monitoring = 49%
SSDS and Vapor Barrier = 0%
Consutruction (Building foundation) = 8.1%
Groundwater Injection = 0%
PM All Components = 7906.7 lbs

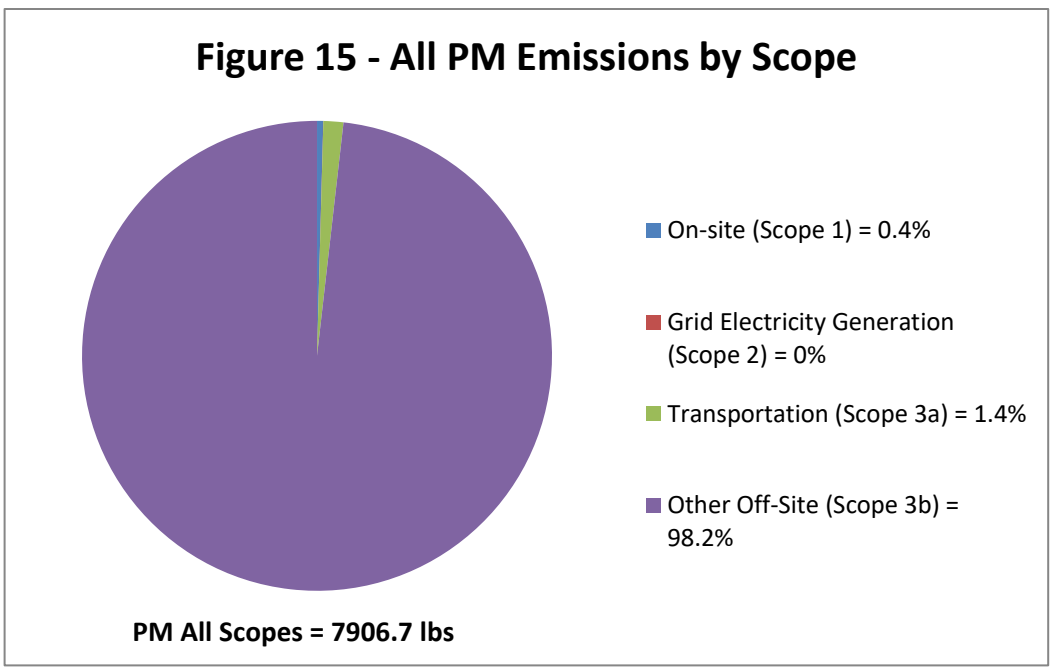


Figure 15 - All PM Emissions by Scope
On-site (Scope 1) = 0.4%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 1.4%
Other Off-Site (Scope 3b) = 98.2%
PM All Scopes = 7906.7 lbs

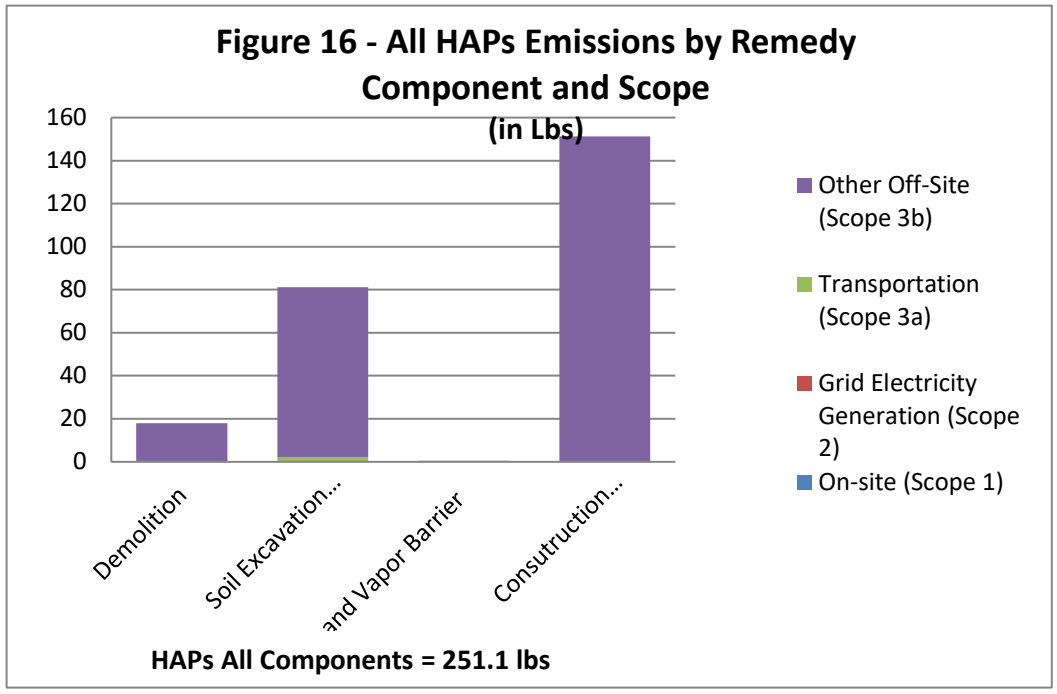


Figure 16 - All HAPs Emissions by Remedy Component and Scope (in Lbs)
160
140
120
100
80
60
40
20
0
Demolition
Soil Excavation...
and Vapor Barrier
Consutruction...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 251.1 lbs

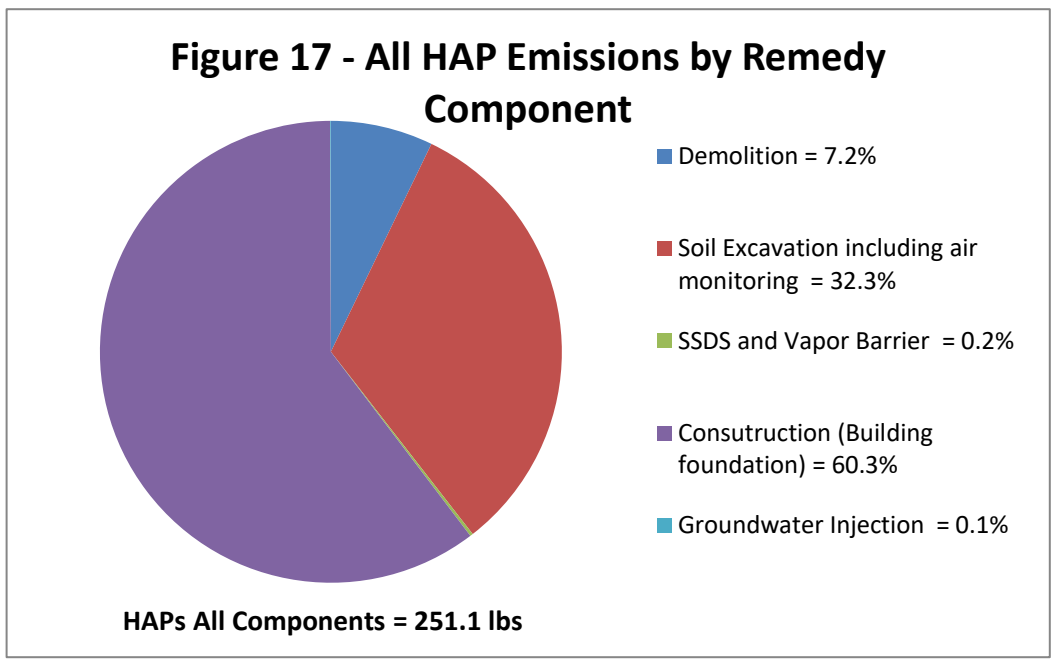


Figure 17 - All HAP Emissions by Remedy Component
Demolition = 7.2%
Soil Excavation including air monitoring = 32.3%
SSDS and Vapor Barrier = 0.2%
Consutruction (Building foundation) = 60.3%
Groundwater Injection = 0.1%
HAPs All Components = 251.1 lbs

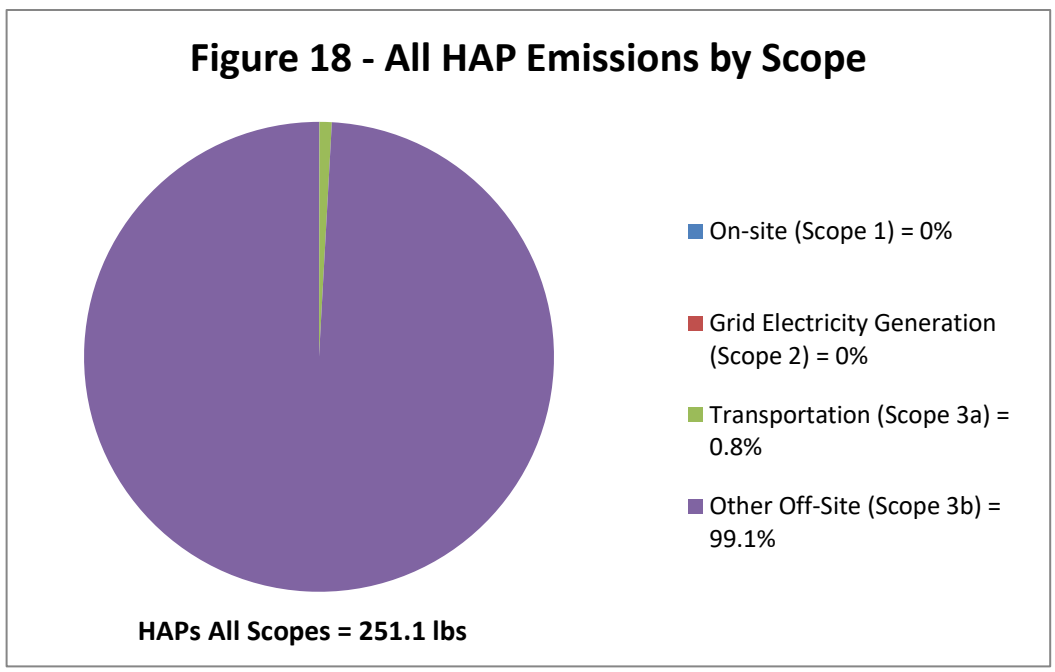


Figure 18 - All HAP Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.8%
Other Off-Site (Scope 3b) = 99.1%
HAPs All Scopes = 251.1 lbs

GSR Summary

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
3083 Webster Ave - <Track 2/4>

Environmental Footprint Summary

Core Element	Metric		Unit of Measure	Footprint						
				Demolition	Soil Excavation	SSDS and Vapor Barrier	Consutruction (Building foundation)	Groundwater Injection	Sampling	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-2	% of refined materials from recycled or reused material	%							
	M&W-3	Unrefined materials used on-site	Tons	0.000	425.000	2.050	415.000	0.500	0.000	842.6
	M&W-4	% of unrefined materials from recycled or reused material	%		0.0%	0.0%	0.0%	0.0%		0.0%
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	8,400.0	8,520.0	0.0	0.0	0.0	0.0	16,920.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%	0.0%	0.0%					0.0%
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	2,226.2	6,023.8	70.7	3,221.9	30.5	20.1	11,593.2
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.000	0.000	0.000	0.000	0.000	0.000	0.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	37.5	1,056.7	0.0	321.8	16.1	0.0	1,432.2
	A-2	On-site HAP emissions	Pounds	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	A-3	Total NOx, SOx, and PM emissions	Pounds	6,250.7	10,174.7	25.8	4,238.4	29.2	167.9	20,886.7
	A-3A	Total NOx emissions	Pounds	2,166.2	4,913.6	16.9	1,872.6	20.4	46.5	9,036.2
	A-3B	Total SOx emissions	Pounds	695.6	1,533.7	7.8	1,728.1	7.7	105.6	4,078.4
	A-3C	Total PM emissions	Pounds	3,388.9	3,727.3	1.1	637.7	1.1	15.9	7,772.1
	A-4	Total HAP emissions	Pounds	18.0	60.8	0.5	151.3	0.1	11.5	242.2
	A-5	Total greenhouse gas emissions	Tons CO2e*	177.2	563.4	2.8	198.8	2.1	1.3	945.5
Land & Ecosystems	Qualitative Description									

** Total greenhouse gases emissions (in CO2e) include consideration of CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)

The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

Notes:

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
3083 Webster Ave - <Track 2/4>

Demolition - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**29**	**4,725**	**36**	**1**	**1**	**38**	**0**
Grid Electricity Generation (Scope 2)	**0.000**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**757**	**122,510**	**926**	**29**	**19**	**974**	**0**
Other Off-Site (Scope 3b)	**1,440**	**227,088**	**1,205**	**665**	**3,370**	**5,240**	**18**
Remedy Totals	**2,226**	**354,323**	**2,166**	**696**	**3,389**	**6,251**	**18**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity
On-site renewable energy generation or use	MMBtu	**0**
On-site biodiesel use	MMBtu	**0**
Biodiesel and other renewable resource use for transportation	MMBtu	**0**
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**
Voluntary purchase of renewable electricity	MWh	**0**
Voluntary purchase of RECs	MWh	**0**

(This value is the sum of the three rows above)

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
3083 Webster Ave - <Track 2/4>

Soil Excavation - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**821**	**132,975**	**1,005**	**32**	**20**	**1,057**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**1,753**	**283,772**	**2,054**	**65**	**43**	**2,161**	**2**
Other Off-Site (Scope 3b)	**3,449**	**710,087**	**1,855**	**1,437**	**3,665**	**6,957**	**59**
Remedy Totals	**6,024**	**1,126,834**	**4,914**	**1,534**	**3,727**	**10,175**	**61**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity
On-site renewable energy generation or use	MMBtu	**0**
On-site biodiesel use	MMBtu	**0**
Biodiesel and other renewable resource use for transportation	MMBtu	**0**
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**
Voluntary purchase of renewable electricity	MWh	**0**
Voluntary purchase of RECs	MWh	**0**

(This value is the sum of the three rows above)

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Consutruction (Building foundation) - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**250**	**40,500**	**306**	**10**	**6**	**322**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**373**	**60,446**	**457**	**15**	**9**	**480**	**0**
Other Off-Site (Scope 3b)	**2,598**	**296,559**	**1,110**	**1,704**	**622**	**3,436**	**151**
Remedy Totals	**3,222**	**397,505**	**1,873**	**1,728**	**638**	**4,238**	**151**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
3083 Webster Ave - <Track 2/4>

SSDS and Vapor Barrier - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**7**	**1,190**	**9**	**0**	**0**	**9**	**0**
Other Off-Site (Scope 3b)	**63**	**4,323**	**8**	**8**	**1**	**16**	**1**
Remedy Totals	**71**	**5,513**	**17**	**8**	**1**	**26**	**1**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity
On-site renewable energy generation or use	MMBtu	**0**
On-site biodiesel use	MMBtu	**0**
Biodiesel and other renewable resource use for transportation	MMBtu	**0**
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**
Voluntary purchase of renewable electricity	MWh	**0**
Voluntary purchase of RECs	MWh	**0**

(This value is the sum of the three rows above)

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Groundwater Injection - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**13**	**2,025**	**15**	**0**	**0**	**16**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**1**	**205**	**2**	**0**	**0**	**2**	**0**
Other Off-Site (Scope 3b)	**17**	**1,979**	**4**	**7**	**1**	**11**	**0**
Remedy Totals	**30**	**4,209**	**20**	**8**	**1**	**29**	**0**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

Sampling - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**2**	**270**	**1**	**0**	**0**	**1**	**0**
Other Off-Site (Scope 3b)	**18**	**2,288**	**45**	**106**	**16**	**167**	**11**
Remedy Totals	**20**	**2,559**	**46**	**106**	**16**	**168**	**12**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

All - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**1,113**	**180,225**	**1,362**	**43**	**27**	**1,432**	**0**
Grid Electricity Generation (Scope 2)	**0.000**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**2,893**	**468,394**	**3,448**	**109**	**71**	**3,627**	**2**
Other Off-Site (Scope 3b)	**7,586**	**1,242,324**	**4,227**	**3,926**	**7,674**	**15,827**	**241**
Remedy Totals	**11,593**	**1,890,943**	**9,036**	**4,078**	**7,772**	**20,887**	**242**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity
On-site renewable energy generation or use	MMBtu	**0**
On-site biodiesel use	MMBtu	**0**
Biodiesel and other renewable resource use for transportation	MMBtu	**0**
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**
Voluntary purchase of renewable electricity	MWh	**0**
Voluntary purchase of RECs	MWh	**0**

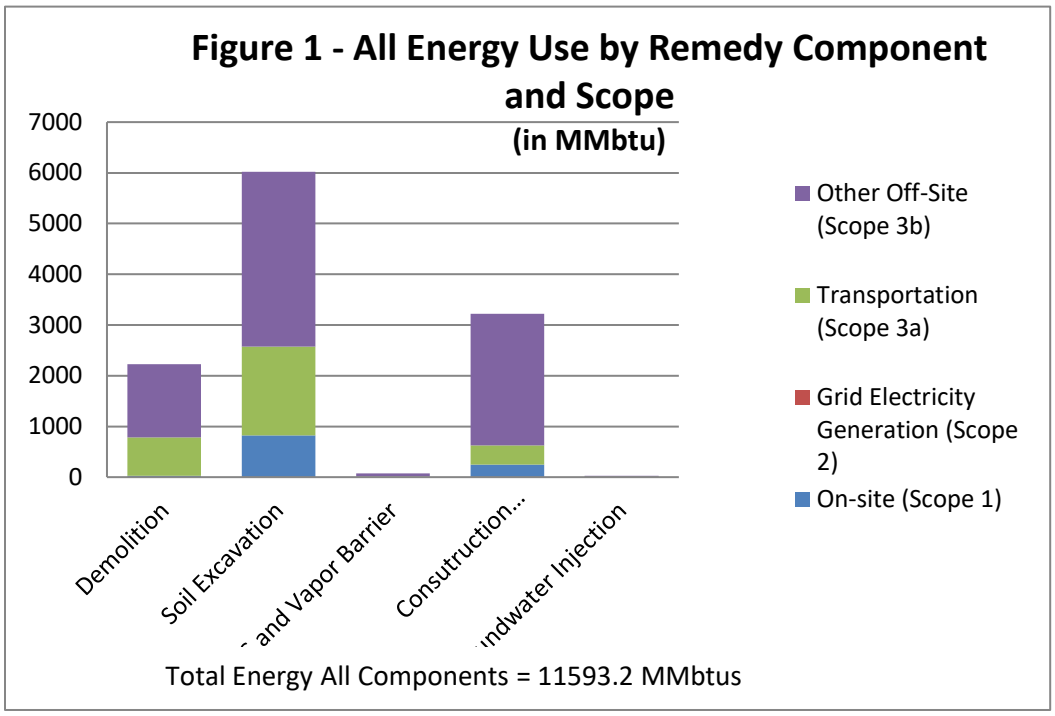
(This value is the sum of the three rows above)

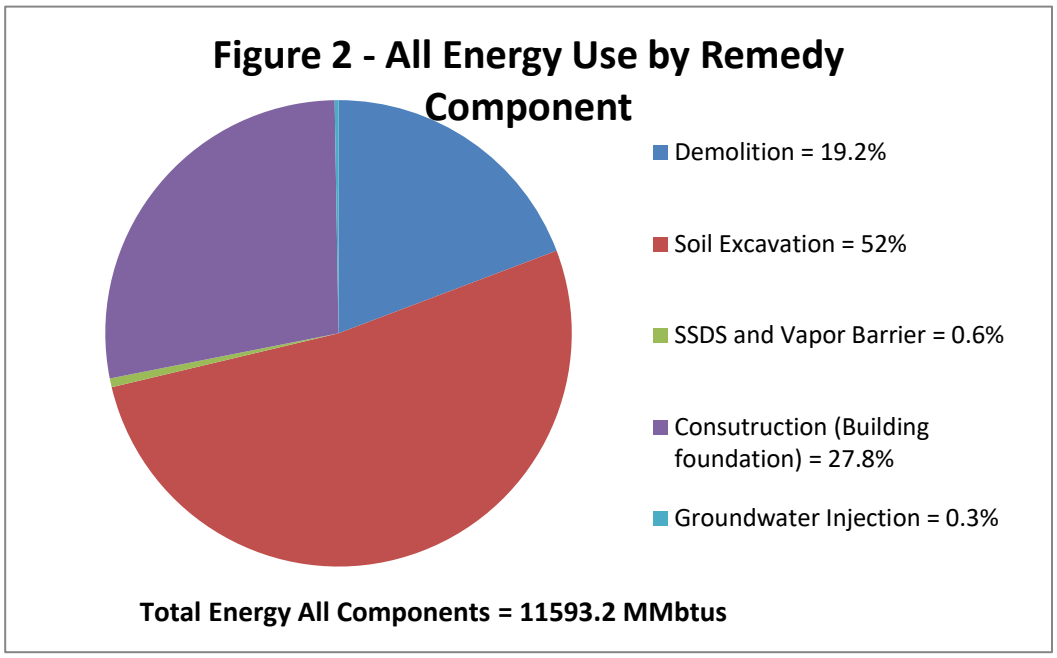
This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_(121718).xlsx

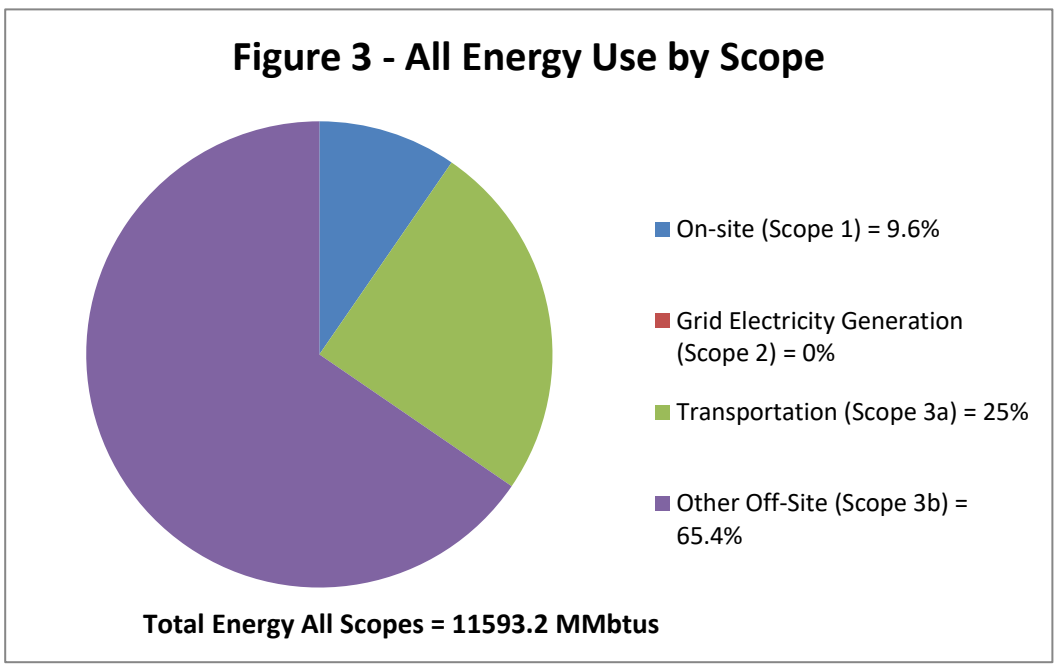
GSR Summary

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019

3083 Webster Ave - <Track 2/4>







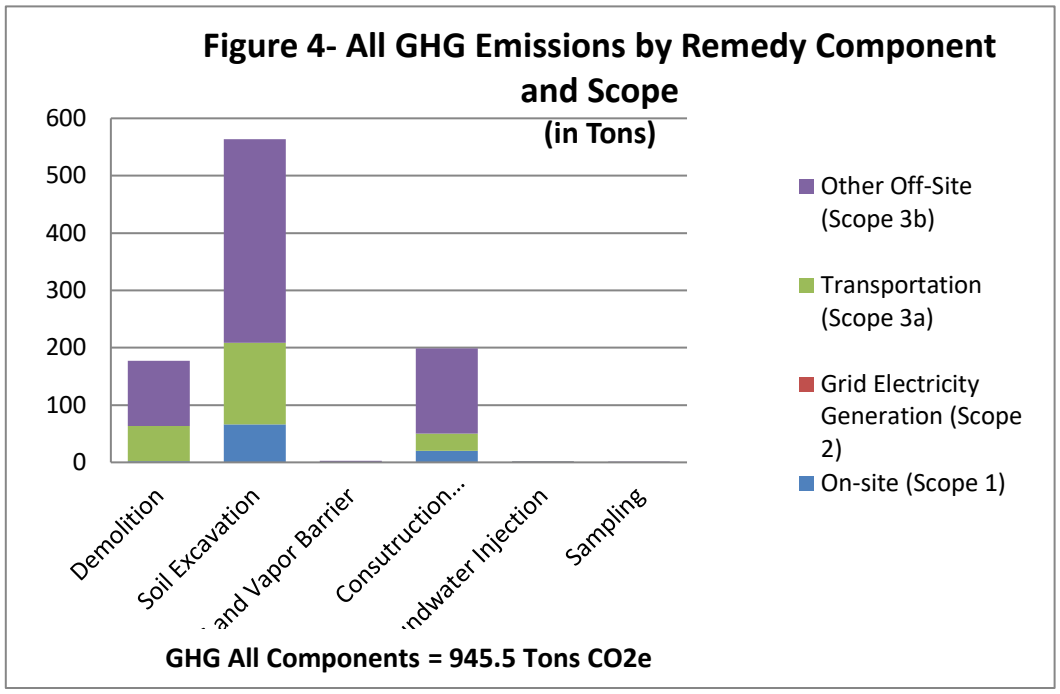


Figure 4- All GHG Emissions by Remedy Component and Scope (in Tons)
600
500
400
300
200
100
0
Demolition
Soil Excavation
and Vapor Barrier
Consutruction...
ndwater Injection
Sampling
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 945.5 Tons CO2e

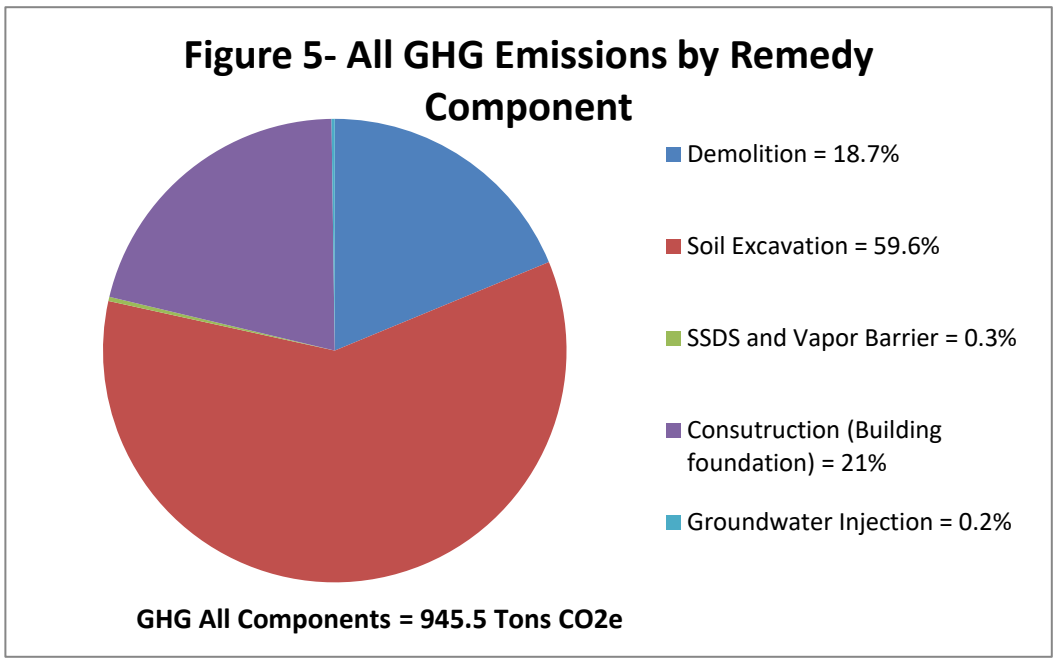


Figure 5- All GHG Emissions by Remedy Component
Demolition = 18.7%
Soil Excavation = 59.6%
SSDS and Vapor Barrier = 0.3%
Consutruction (Building foundation) = 21%
Groundwater Injection = 0.2%
GHG All Components = 945.5 Tons CO2e

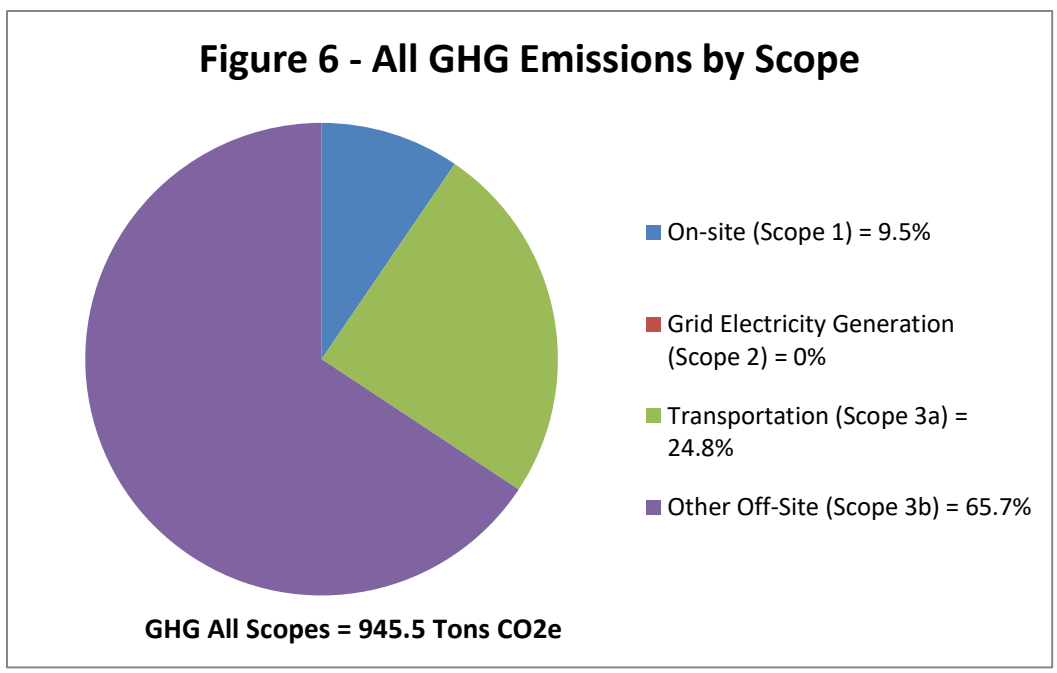


Figure 6 - All GHG Emissions by Scope
On-site (Scope 1) = 9.5%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 24.8%
Other Off-Site (Scope 3b) = 65.7%
GHG All Scopes = 945.5 Tons CO2e

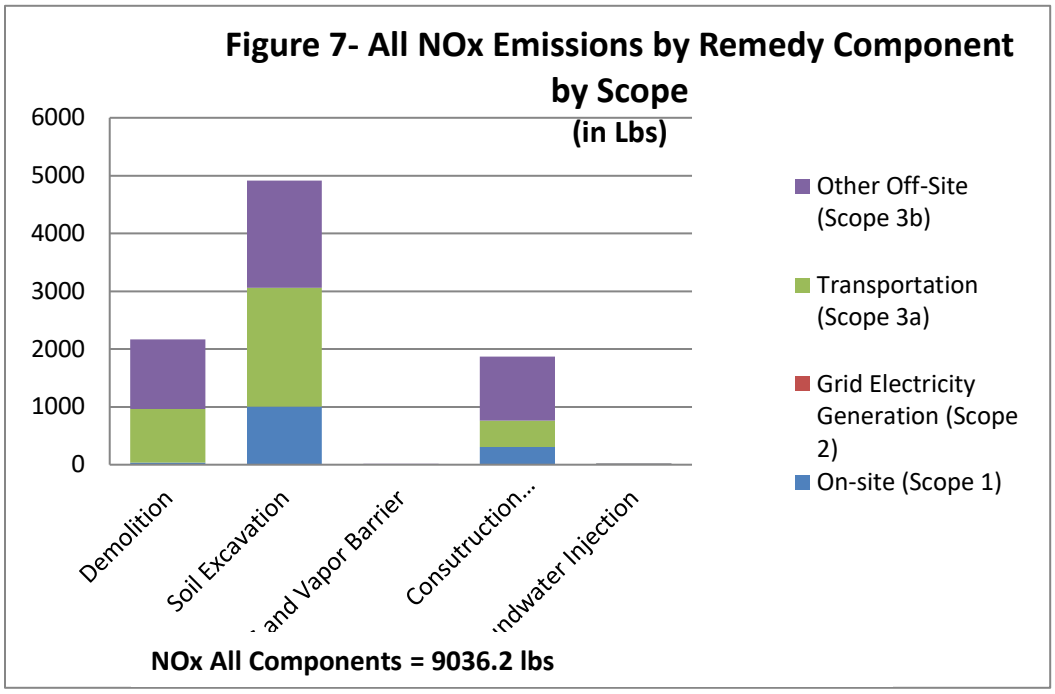


Figure 7- All NOx Emissions by Remedy Component by Scope
(in Lbs)
6000
5000
4000
3000
2000
1000
0
Demolition
Soil Excavation
and Vapor Barrier
Consutruction...
ndwater Injection
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 9036.2 lbs

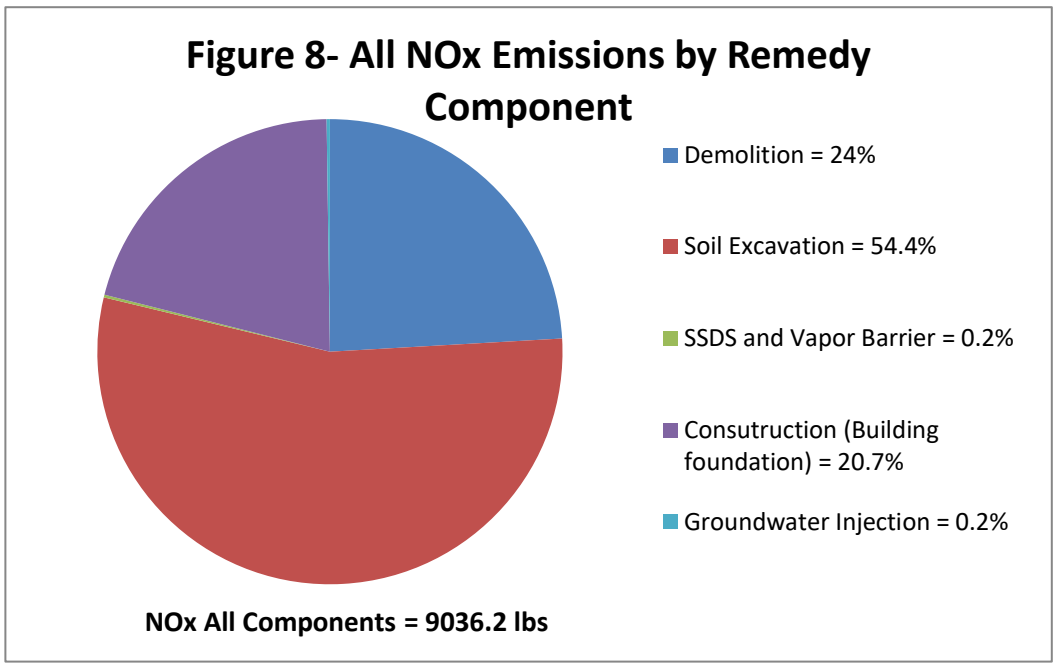


Figure 8- All NOx Emissions by Remedy Component
Demolition = 24%
Soil Excavation = 54.4%
SSDS and Vapor Barrier = 0.2%
Consutruction (Building foundation) = 20.7%
Groundwater Injection = 0.2%
NOx All Components = 9036.2 lbs

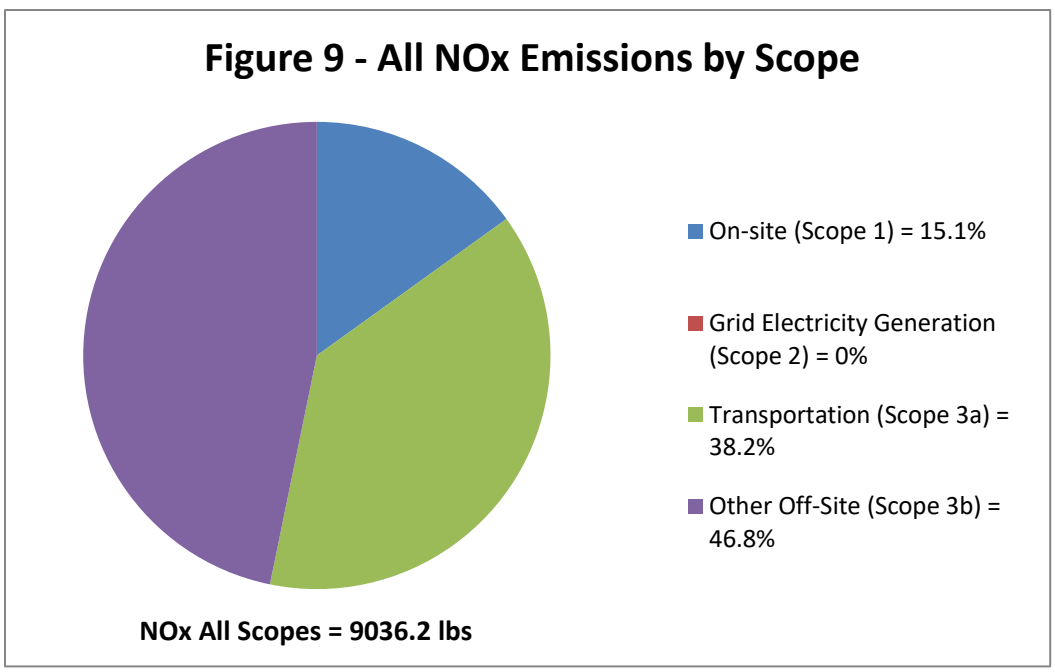


Figure 9 - All NOx Emissions by Scope
On-site (Scope 1) = 15.1%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 38.2%
Other Off-Site (Scope 3b) = 46.8%
NOx All Scopes = 9036.2 lbs

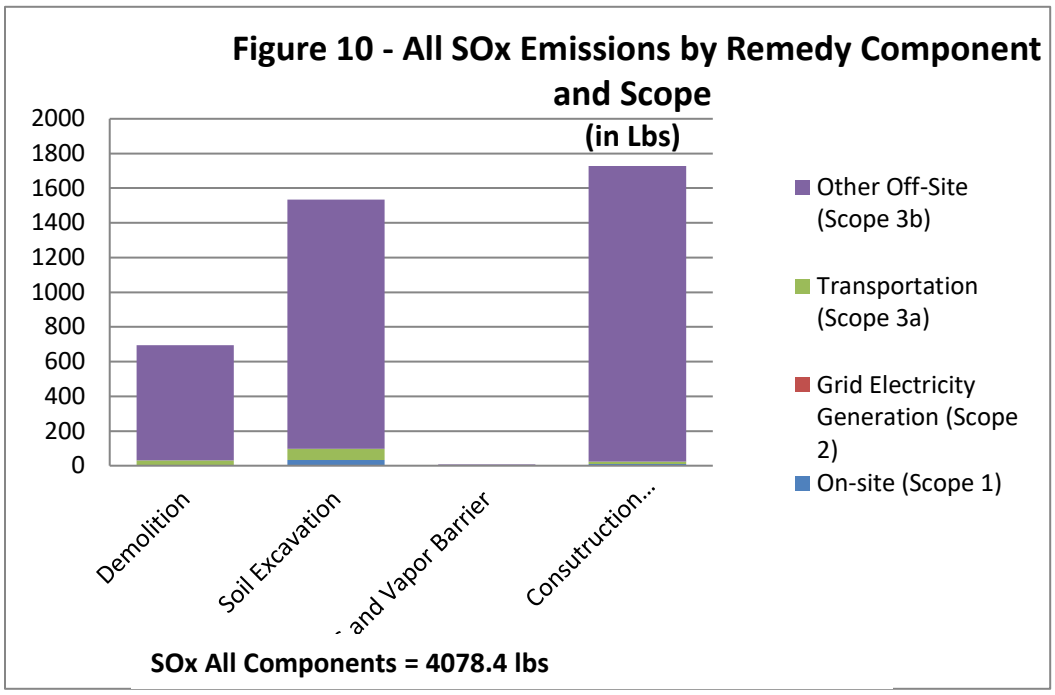


Figure 10 - All SOx Emissions by Remedy Component and Scope
(in Lbs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Demolition
Soil Excavation
and Vapor Barrier
Consutruction...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 4078.4 lbs

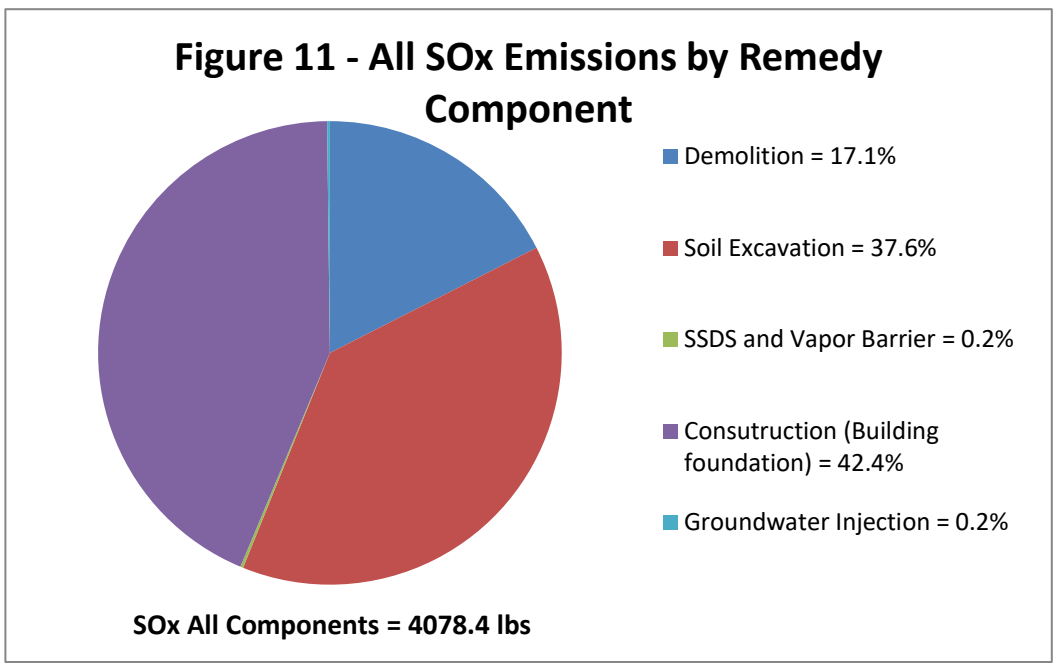


Figure 11 - All SOx Emissions by Remedy Component
Demolition = 17.1%
Soil Excavation = 37.6%
SSDS and Vapor Barrier = 0.2%
Consutruction (Building foundation) = 42.4%
Groundwater Injection = 0.2%
SOx All Components = 4078.4 lbs

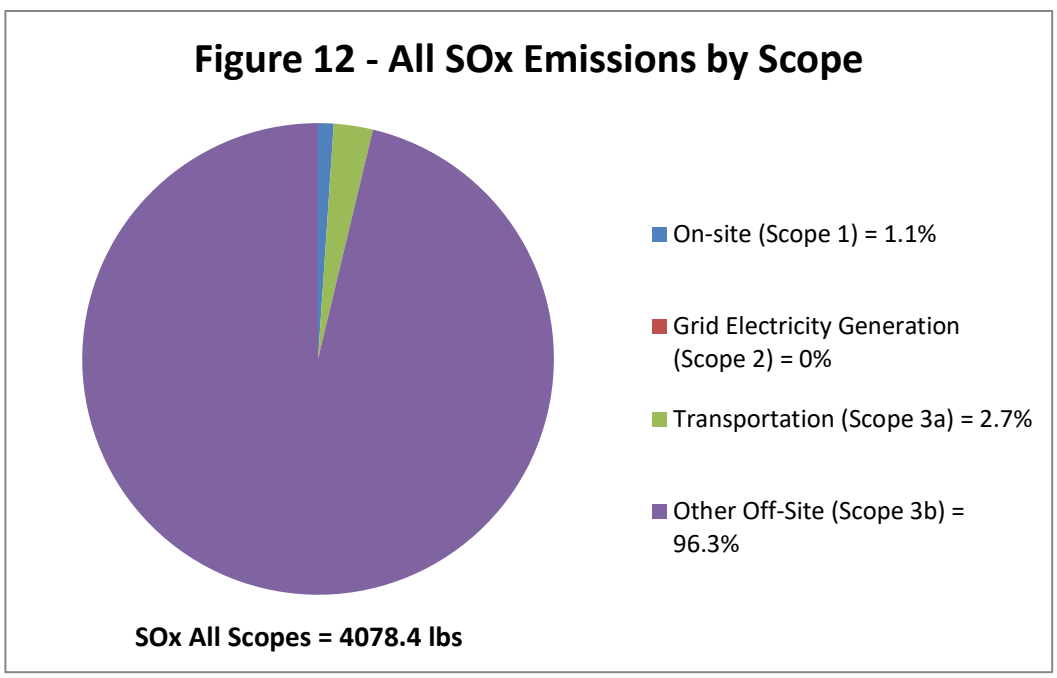


Figure 12 - All SOx Emissions by Scope
On-site (Scope 1) = 1.1%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 2.7%
Other Off-Site (Scope 3b) = 96.3%
SOx All Scopes = 4078.4 lbs

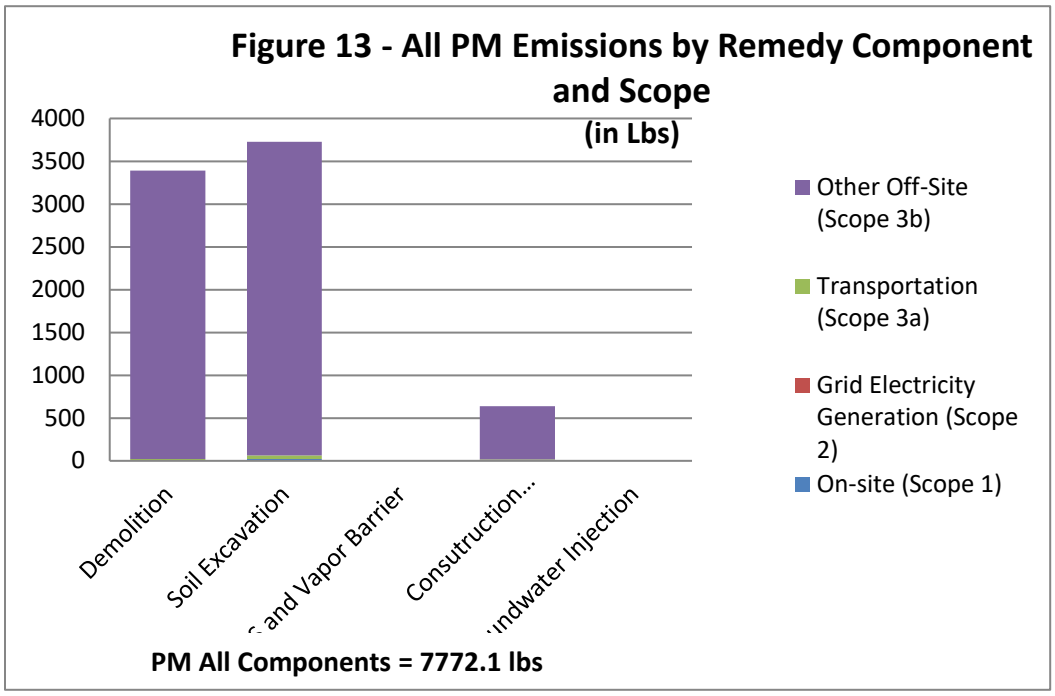


Figure 13 - All PM Emissions by Remedy Component and Scope
(in Lbs)
4000
3500
3000
2500
2000
1500
1000
500
0
Demolition
Soil Excavation
and Vapor Barrier
Consutruction...
ndwater Injection
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 7772.1 lbs

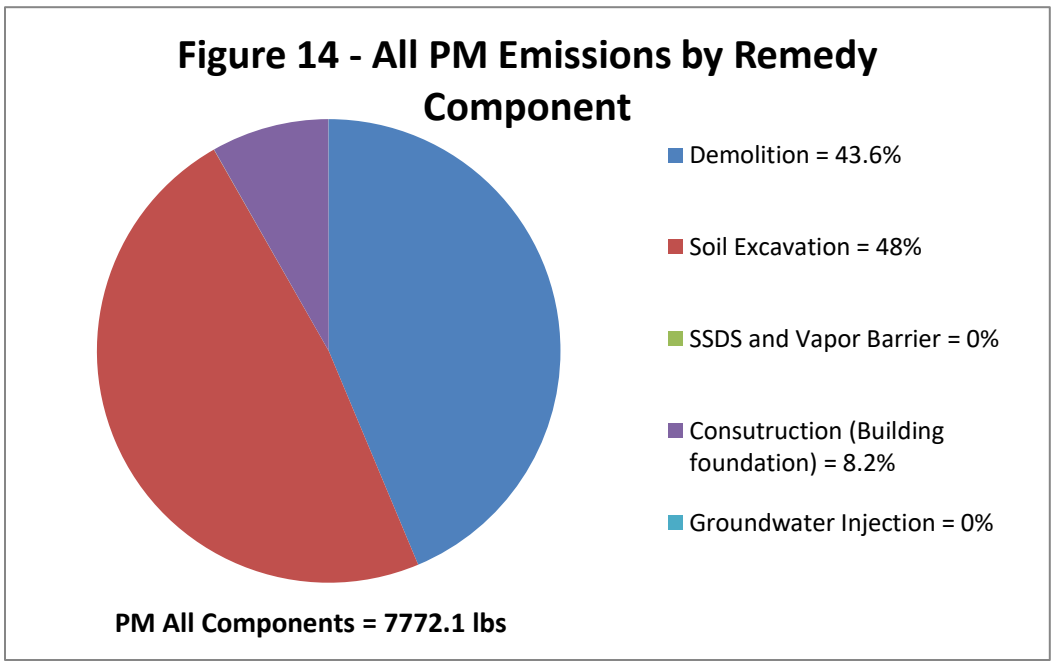


Figure 14 - All PM Emissions by Remedy Component
Demolition = 43.6%
Soil Excavation = 48%
SSDS and Vapor Barrier = 0%
Consutruction (Building foundation) = 8.2%
Groundwater Injection = 0%
PM All Components = 7772.1 lbs

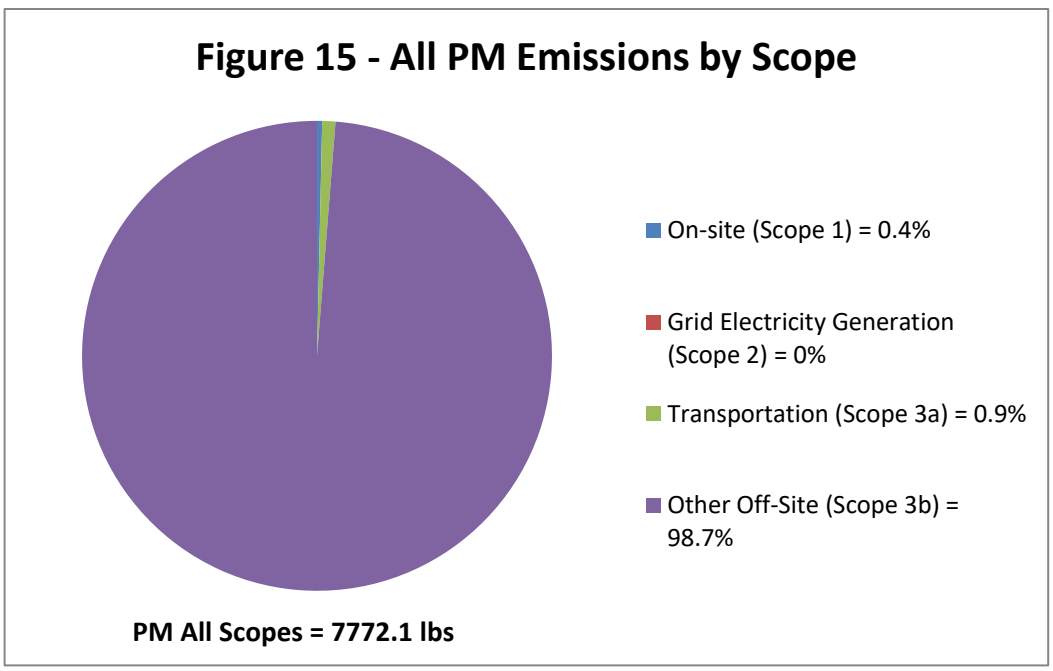


Figure 15 - All PM Emissions by Scope
On-site (Scope 1) = 0.4%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.9%
Other Off-Site (Scope 3b) = 98.7%
PM All Scopes = 7772.1 lbs

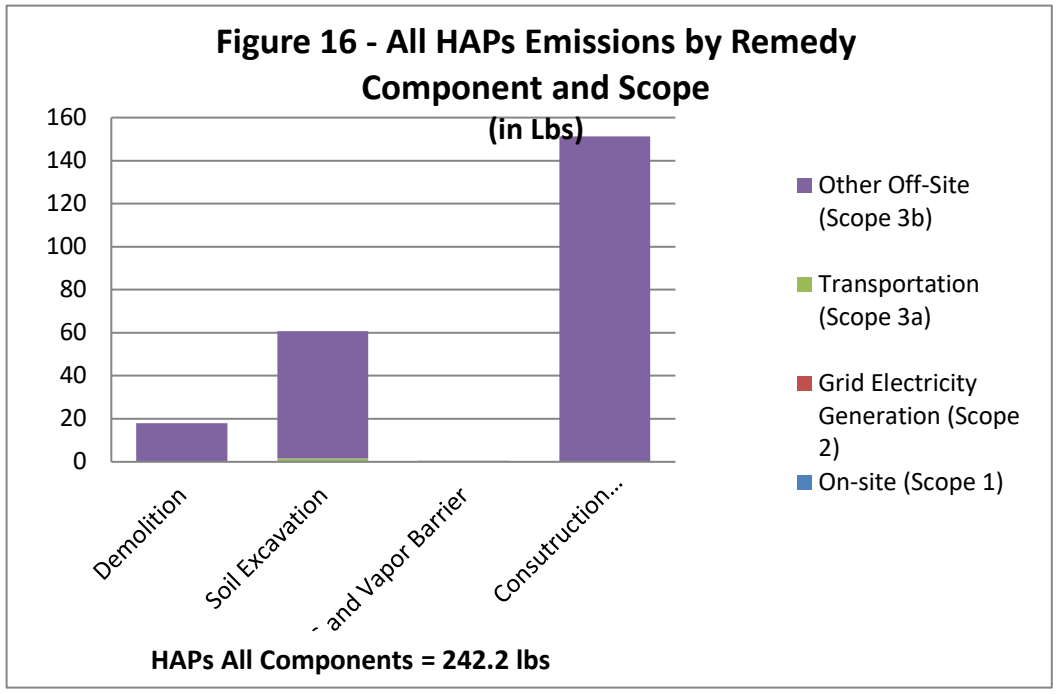


Figure 16 - All HAPs Emissions by Remedy Component and Scope (in Lbs)
160
140
120
100
80
60
40
20
0
Demolition
Soil Excavation
and Vapor Barrier
Consutruction...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 242.2 lbs

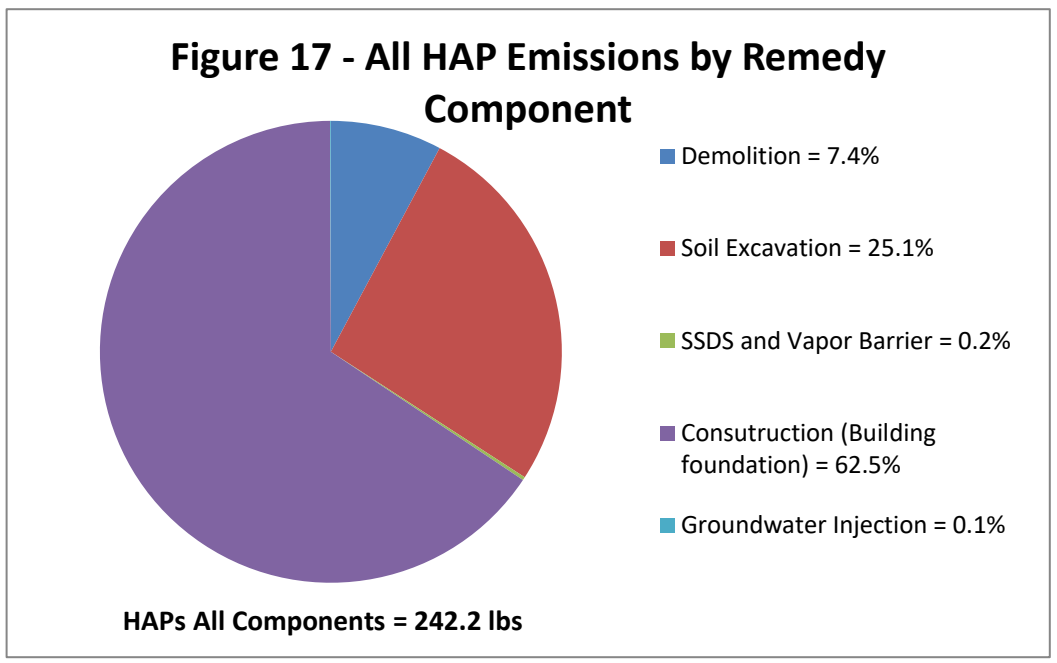


Figure 17 - All HAP Emissions by Remedy Component
Demolition = 7.4%
Soil Excavation = 25.1%
SSDS and Vapor Barrier = 0.2%
Consutruction (Building foundation) = 62.5%
Groundwater Injection = 0.1%
HAPs All Components = 242.2 lbs

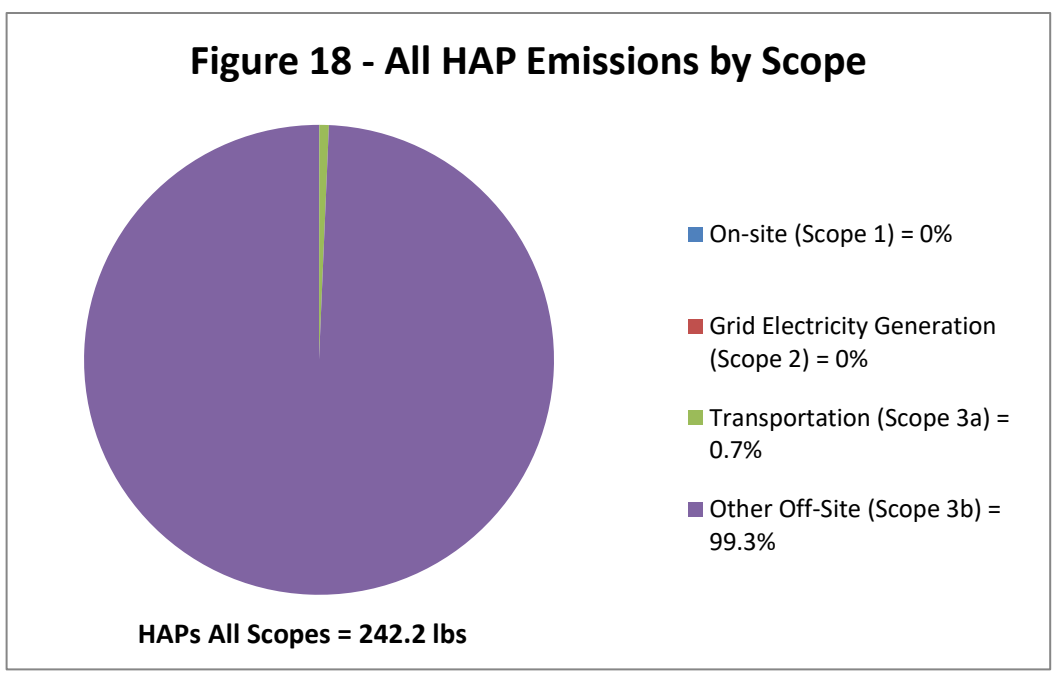


Figure 18 - All HAP Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.7%
Other Off-Site (Scope 3b) = 99.3%
HAPs All Scopes = 242.2 lbs

Appendix F

Health and Safety Plan

HEALTH & SAFETY PLAN

3083 Webster Ave BCP Site

3083 Webster Avenue
Block 3331; Lot 57
Bronx New York

NYSDEC Site Number: C203184

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2.0 Health & Safety Staff....3
3.0 Chemical & Waste Description/Characterization....4
4.0 Hazard Assessment....5
5.0 Training....17
6.0 Medical Surveillance....18
7.0 Site Control, PPE & Communications....19
8.0 Air Monitoring Plan....22
9.0 Safety Considerations....26
10.0 Decontamination and Disposal Procedures....29
11.0 Emergency Plan....31
12.0 Logs, Reports & Record Keeping....35
13.0 Sanitation....36

Figures

1. Directions to Hospital

Attachments

A. Accident/Incident Report Log
B. Health and Safety Fact Sheets

1.0 Introduction

The HASP has been prepared in conformance with the United States Department of Labor's Occupational Safety and Health Administration (OSHA) applicable regulations, safe work practices and the project's requirements. It addresses those activities associated with the implementation of the proposed Remedial Action Work Plan (RAWP) for 3083 Webster Ave BCP Site located at 3083 Webster Avenue, Bronx – New York City Tax Block 3331 and Lot 57, Bronx, New York (Site #224208).

The Project Manager (PM), Site Safety Officer (SSO) and HydroTech field personnel will implement the Plan during site work under the direction of the Qualified Environmental Professional (QEP) and the Corporate Safety Officer (CSO). Compliance with this HASP is required of all persons and third parties who perform fieldwork for this project. Assistance in implementing this HASP can be obtained from the SSO. The content of this HASP may change or undergo revision based upon additional information that is made available to health and safety personnel, monitoring results or changes in the technical scope of work. Any changes proposed must be reviewed by the SSO.

SCOPE OF WORK

The Scope of Work activities will include the following:

- Soil Excavation and disposal;
- Performance of Community Air Monitoring Program (CAMP);
- Performance of bioremedial injections for groundwater treatment;
- Collection of end-point soil samples;
- Oversight of installation of engineering controls.

EMERGENCY NUMBERS

Contact	Phone Number
NYC Health/ North Central Bronx Hospital	718-519-5000
New York City EMS	911
NYPD	911
NYFD	911
National Response Center	800-424-8802
Poison Information Center	800-562-8816
Chemtree	800-424-9555

Project Management/Health and Safety Personnel

Title	Contact	Cell Phone
PM	Paul I. Matli	(631) 241-7165
QAO	Marie Rose Farah	(607) 262-3265
Site Safety Officer	Dan Kapustin	(845) 608-4461

Directions to North Central Bronx Hospital (See Figure 1)
Upon leaving the Site, head southwest on Webster Avenue toward East 202nd Street. Turn right onto East Mosholu Parkway North and then turn right onto Steuben Avenue. Turn left onto East 210 Street and then right onto Kossuth Avenue. Arrive to the hospital on the right.

2.0 Health and Safety Staff

This section briefly describes the personnel and their health and safety responsibilities for the:

Project Manager (PM)
- Has the overall responsibility for the health and safety of site personnel
- Ensures that adequate resources are provided to the field health and safety staff to carry out their responsibilities as outlined below.
- Ensures that fieldwork is scheduled with adequate personnel and equipment resources to complete the job safely.
- Ensures that adequate telephone communication between field crews and emergency response personnel is maintained.
- Ensures that field site personnel are adequately trained and qualified to work at the Site.

Resumes for Hydro Tech Project Staff involved in this project are provided in Appendix 9 of the Remedial Action Work Plan Work Plan (RAWP).

SITE SAFETY OFFICER (SSO)
- Conducts initial onsite screening of body temperature of personnel and/or subcontractors before entering the job site and monitor all field personnel for health-related symptoms that could be indicative of Covid-19 infection.
- Documents individual temperature screening and any other observations for every field personnel in a daily log.
- Directs and coordinates health and safety monitoring activities pertaining to the performance of all aspects of fieldwork.
- Conduct a briefing on social distancing and other specific field training prior to personnel and/or subcontractors proceeding to work.
- Ensures that field teams utilize proper personal protective equipment (PPE).

- Conduct and document periodic safety briefings; ensures that field team members comply with this HASP.
- Completes and maintains Accident/Incident Report Forms.
- Notifies Hydro Tech corporate administration of all accidents/incidents.
- Determines upgrade or downgrade of PPE based on site conditions and/or downgrade of PPE based on site conditions and/or real-time monitoring results.
- Ensures that monitoring instruments are calibrated daily or as determined by manufactured suggested instructions.
- Maintains health and safety field logbooks.
- Develops and ensures implementation of the HASP.
- Approves revised or new safety protocols for field operations.
- Coordinates revisions of this HASP with field personnel and the SSO Division Contracting Officer.
- Responsible for the development of new company safety protocols and procedures and resolution of any outstanding safety issues which may arise during the conduction of site work.
- Reviews personnel and subcontractors current and up-to-date medical examination and acceptability of health and safety training.

CORPORATE SAFETY OFFICER (CSO)
As necessary, the Corporate Safety Officer (CSO) will be an alternate to the SSO and will perform the same duties as the SSO listed above.

Attachment A contains Accident/Incident Report Log

FIELD PERSONNEL AND SUBCONTRACTORS (IF ANY)
- Reports any unsafe or potentially hazardous conditions to the SSO.
- Maintains knowledge of the information, instructions and emergency response actions contained in this HASP.
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions that are instituted.
- Prevents admittance to work sites by unauthorized personnel.

3.0 Chemical & Waste Description/Characterization

The following list of chemicals is based on the materials that are believed to be formerly stored or detected onsite at concentrations exceeding regulatory standards:

Volatile Organic Compounds
- 1,2,4-trimethylbenzene
- 1,3,5-trimethylbenzene
- Xylenes
- N-butylbenzene

- N-propylbenzenewere
- Sec-butylbenzene
- Tetrachloroethylene
- Trichloroethylene
- Cis-1,2-Dichloroethyelene
- 1,2-Dichloroethane
- Vinyl Chloride
- 1,2,4-Trimethylbenzene
- Xylenes

Semi Volatile Organic Compounds
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Chrysene
- Indeno(1,2,3-cd)pyrene
- Naphthalene

Metals
- Chromium trivalent
- Barium

PFAS
- PFOA
- PFOS

Attachment B contains health and safety fact sheets contaminants of concern.

The following information references are presented in order to identify the properties and hazards of the materials that may/will be encountered at the Site.

- Dangerous Properties of Industrial Materials - Sax
- Chemical Hazards of the Workplace - Proctor/Hughes
- Condensed Chemical Dictionary – Hawley
- Rapid Guide to Hazardous Chemical in the Workplace - Lewis 1990.
- NIOSH Guide to Chemical Hazards - 1990
- ACGIH TLV Values and Biological Exposure Indices - 1991-1992

4.0 Hazard Assessment

The potential hazards associated with planned site activities include chemical, physical and biological hazards. This section discusses those hazards that are anticipated to be encountered during the activities listed in the scope of work.

The potential to encounter chemical hazards is dependent upon the work activity performed (invasive or non-invasive), the duration and location of the work activity. Such hazards could include inhalation or skin contact with chemicals that could cause dermatitis, skin burn, being overcome by vapors or asphyxiation. In addition, the handling of contaminated materials and chemicals could result in fire and/or explosion.

The potential to encounter physical hazards during site work includes heat stress, exposure to excessive noise, loss of limbs, being crushed, head injuries, cuts and bruises and other physical hazards due to motor vehicle operation, heavy equipment and power tools.

CHEMICAL HAZARDS

The potential for personnel and subcontractors to come in contact with chemical hazards may occur during the following tasks:

- Soil Excavation and disposal;
- Performance of Community Air Monitoring Program (CAMP);
- Performance of bioremedial injections for groundwater treatment;
- Collection of end-point soil samples;
- Oversight of installation of engineering controls.

Exposure Pathways
Exposure to these compounds during ongoing activities may occur through inhalation of contaminated dust particles, inhalation of volatile (VOC) and semi-volatile (SVOC) vapor fume compounds, by way of dermal absorption, and accidental ingestion of the contaminant by either direct or indirect cross contamination activities (eating, smoking, poor hygiene). Indirectly, inhalation of contaminated dust particles (VOCs, SVOCs) can occur during adverse weather conditions (high or changing wind directions) or during operations that may generate airborne dust such as excavation, and sampling activities. Dust control measures such as applying water to roadways and work sites will be implemented, where visible dust is generated from non-contaminated and contaminated soils. Where dust control measures are not feasible or effective, respiratory protection will be used.

Additional Precautions
Dermal absorption or skin contact with chemical compounds is possible during invasive activities at the Site, including removal of product, excavation of tanks, and handling of contaminated soils. The use of PPE in accordance with Section 9.2 and strict adherence to proper decontamination procedures should significantly reduce the risk of skin contact.

The potential for accidental ingestion of potentially hazardous chemicals is expected to be remote, when good hygiene practices are used.

PHYSICAL HAZARDS

A variety of physical hazards may be present during Site activities. These hazards are similar to those associated with any construction type project. These physical hazards are due to motor vehicles, and heavy equipment operation, the use of improper use of power and hand tools, misuse of pressurized cylinders, walking on objects, tripping over objects, working on surfaces which have the potential to promote falling, mishandling and improper storage of solid and hazardous materials, skin burns, crushing of fingers, toes, limbs, hit on the head by falling objects or hit one's head due to not seeing the object of concern, temporary loss of one's hearing and/or eyesight. Theses hazards are not unique and are generally familiarly to most hazardous waste site workers at construction sites. Additional task specific safety requirements will be covered during safety briefings.

Noise
Noise is a potential hazard associated with operation of heavy equipment, power tools, pumps and generators. High noise operators will be evaluated at the discretion of the SSO. Employees with an 8-hour time weighted average exposure exceeding 85 decibels (db) will be included in the hearing conservation program in accordance with 29 CFR 1910.85.

It is mandated that employees working around heavy equipment or using power tools that dispense noise levels exceeding 95 db are to wear hearing protection that shall consist of earplugs and earphones. This is particularly relevant as the jet engines of modern airplanes can give sound level readings of greater than 110 db.

Heat/Cold Stress
Extremes in temperature and the effects of hard work in impervious clothing can result in heat stress and/or hypothermia. The human body is designed to function at a certain internal temperature. When metabolism or external sources (fire, hot summer day, winter weather, etc.) cause the body temperature to rise or fall excessively, the body seeks to protect itself by triggering cooling/warming mechanisms. Profuse sweating is an example of a cooling mechanism, while uncontrollable shivering is an example of a warming mechanism. The SSO monitor the temperature to determine potential adverse effects the weather can cause on site personnel.

Protective clothing worn to guard against chemical contact effectively stops the evaporation of perspiration. Thus, the use of protective clothing increases heat stress problems. Cold stress can easily occur in winter with sub-freezing ambient temperatures. Workers in protective garments may heat-up and sweat, only to rapidly

cool once out of the tank and the PPE. The major disorders due to heat stress are heat cramps, heat exhaustion and heat stroke.

HEAT CRAMPS are painful spasms that occur in the skeletal muscles of workers who sweat profusely in the heat and drink large quantities of water but fail to replace the body's lost salts or electrolytes. Drinking water while continuing to lose salt tends to dilute the body's extra cellular fluids. Soon water seeps by osmosis into active muscles and causes pain. Muscles fatigued from work as usually most susceptible to cramps.

HEAT EXHAUSTION is characterized by extreme weakness or fatigue, dizziness, nausea, and headache. In serious cases, a person may vomit or lose consciousness. The skin is clammy and moist, complexion pale or flushed, and body temperature normal or slightly higher than normal. Treatment is rest in a cool place and replacement of body water lost by perspiration. Mild cases may recover spontaneously with this treatment; severe cases may require care for several days. There are no permanent effects.

HEAT STROKE is a very serious condition caused by the breakdown of the body's heat regulating mechanisms. The skin is very dry and hot with red mottled or bluish appearance. Unconsciousness, mental confusion or convulsions may occur. Without quick and adequate treatment, the result can be death or permanent brain damage. Get medical assistance quickly! As first aid treatment, the person should be moved to a cool place. Soaking the person's clothes with water and fanning them should reduce body heat artificially, but not too rapidly.

Steps that can be taken to reduce heat stress are:

- Acclimatize the body. Allow a period of adjustment to make further heat exposure endurable.
- Drink more liquids to replace body water lost during sweating.
- Rest is necessary and should be conducted under the monitoring condition from the SSO and the effect personnel physiological state.
- Wearing personal cooling devices. There are two basic designs; units with pockets for holding frozen packets and units that circulate a cooling fluid from a reservoir through tubes to different parts of the body. Both designs can be in the form of a vest, jacket or coverall. Some circulating units also have a copy for cooling the head.

Cold temperatures can cause problems. The severe effects are FROSTBITE and HYPOTHERMIA.

FROSTBITE is the most common injury resulting from exposure to cold. The extremities of the body are often affected. The signs of frostbite are:

- The skin turns white or grayish-yellow

- Pain is sometimes felt early but subsides later. Often there is no pain
- The affected part feels intensely cold and numb

Shivering, numbness, drowsiness, muscular weakness and a low internal body temperature characterize the condition known as HYPOTHERMIA. This can lead to unconsciousness and death. With both frostbite and hypothermia, the affected areas need to be warmed quickly. Immersing in warm, not hot, water best does this. In such cases medical assistance will be sought.

To prevent these effects from occurring, persons working in the cold should wear adequate clothing and reduce the time spent in the cold area. The field SSO, to determine appropriate time personnel may spend in adverse weather conditions, will monitor this.

Lockout/Tagout
PURPOSE -- This program establishes procedures for de-energizing, isolating and ensuring the energy isolation of equipment and machinery. The program will be used to ensure that equipment and machinery is de-energizing and isolated from unexpected energization by physically locking (Lockout) energy isolation devices or, in the absence of locking capabilities, tagout (Tagout) the device to warn against energization. These procedures will provide the means of achieving the purpose of this program, prevention of injury to Hydro Tech employees from the unexpected energization or start-up of equipment and machinery, or from the release of stored energy.

APPLICATION -- This program applies to the control of energy during the servicing and/or maintenance of equipment and machinery. This program covers normal operations only if a guard or other safety device is removed or bypassed, or any part of the body is placed into an area of the equipment or machinery where work is performed on the material, or a danger zone exists during the operating cycle. Minor tool changes, adjustments, and other minor servicing activities which take place during normal production operations do not require isolation and lockout/tagout if they are routine and integral to the use of the equipment.

SCOPE -- This program will include all employees whose duties require them to service, install, repair, adjust, lubricate, inspect or perform work on powered equipment or machinery that may also have the potential for stored energy.

PROGRAM RESPONSIBILITIES -- The SSO will have the overall responsibility of the program to ensure that; authorized and affected employees receive adequate training and information, the program is evaluated annually, and the lockout/tagout equipment is properly used and the procedures of this program are followed.

The program evaluation will be conducted to ensure that the procedures and

requirements of the program are being followed and will be utilized to correct any deviations or inadequacies that may be discovered. The evaluation will consist of one or more inspections or audits of actual lockout/tagout procedures being used to isolate equipment. A review of the authorized and affected employee's responsibilities will be conducted at the time of the inspection /audit. Any authorized employee, except the one(s) utilizing the energy isolation procedure being inspected, may perform the inspection/audit.

A record will be maintained of program evaluation inspections and will include:

1. The identity of the equipment or machine on which energy control procedures were being utilized.
2. The date(s) of the inspection(s).
3. The employee(s) included in the inspection(s).
4. The person performing the inspection.

Authorized employees (persons who implement lockout/tagout procedures) will be responsible for following the procedures established by this program.

Affected employees are responsible for understanding the significance of a lockout/tagout device and the prohibition relating to attempts to restart or re-energize equipment or machinery that is locked out or tagged out.

TRAINING – Where applicable, Hydro Tech employees will be provided instruction in the purpose and functions of the energy control program to ensure that they understand the significance of locked or tagged out equipment and also have the knowledge and skill to correctly apply and remove energy controls. Training will include:

The recognition of applicable hazardous energy source(s), the type and magnitude of energy available, and the policies and procedures of the Hydro Tech energy control program.

1. Affected employees will be made aware of the purpose and use of energy control procedures and the prohibition relating to attempts to remove lockout or tagout devices.

2. Instruction in the limitations of tagout as a sole means of energy control.
   a. Tags are warning devices and <u>do not</u> provide the physical restraint that a lock would.
   b. Tags may provide a false sense of security.
   c. Tags may become detached during use.

Initial training will be provided during to energy control program implementation, when new employees are hired or when job responsibilities change to include utilization of energy control procedures.

Retraining will be conducted whenever there is a change in job assignments that require the employee to utilize energy control procedures, a change in equipment that presents a new hazard, a change in the energy control procedures or when the program evaluation identifies inadequacies in the energy control program procedures.

Records of employee training will be maintained and will include the employee's name and date(s) of training.

STANDARD OPERATING PROCEDURES –where necessary, Hydro Tech will provide the necessary devices to effectively lockout or tagout energy isolating devices. Lockout/tagout devices will be the only devices used for controlling energy and shall not be used for other purposes. Any device used for lockout/tagout will be capable of withstanding the environment to which they are exposed for the maximum period they are to be exposed. The devices will be substantial enough to prevent removal without excessive force. Excessive force for a locking device would be bolt cutters or other metal cuttings tools. Tagout devices will be attached by a non-reusable method, attachable by hand, and very difficult to remove by hand. A nylon cable tie or equivalent will be used.

Lockout/tagout devices will indicate the identity of the employee who applied the device, and the tagout device will warn against the hazards if the equipment is energized.

Lockout is the preferred method of energy isolation. When physical lockout is not possible, the energy isolation will be tagged out of service with a warning tag attached at the power source. In the case of plug-in power source, the tag will be attached at the male plug. To ensure full employee protection using tagout instead of lockout, additional steps should be taken to guard against accidental or inadvertent energization. These steps may include, where applicable: removal of fuses, blocking switches, removal of a valve handle.

STANDARD OPERATING PROCEDURES

I. APPLICATION OF CONTROLS
A. Preparing to Shut Down Equipment

1. Prior to equipment shutdown, the authorized employee(s) must have knowledge of:

a. The type(s) and magnitude of power.

b. The hazards of the energy to be controlled.
c. The method(s) to control the energy.
d. The location and identity of all isolating devices that control or feed the equipment to be locked/tagged out.

2. Notify all affected employees that the lockout/tagout system will be in effect.
3. Assemble applicable lockout/tagout devices, i.e., padlocks, tags, multiple lock hasps, etc.

B. Equipment Shutdown and Isolation

1. If equipment is in operation, shut it down by the normal stopping procedure (stop button, switch).
2. Operate disconnects, switches, valves, or other energy isolating devices so that the equipment is de-energizing and isolated from its energy source(s).
3. Verify that equipment is shut down by operating equipment from the normal operating location and any remote locations.

C. Installation of Lockout/Tagout Device, Release of Stored Energy, and Verification

1. Attach individually assigned lock(s) or tag(s) to energy isolating device(s). Where it is not possible to lock a switch, valve or other isolating device, electrical fuses must be removed, blank flanges installed in piping, lines disconnected, or other suitable methods used to ensure that equipment is isolated from energy sources. A tag must be installed at the point of power interruption to warn against energizing.
    a. Each lock or tag must positively identify the person who applied it and locks must be individually keyed.
    b. If more than one person is involved in the task, employees will place their own lock and tag. Multiple lock hasps are available for this.
2. Release, restrain, or dissipate stored energy such spring tension, elevated machine members, rotating flywheels, hydraulic pressure, pistons and air, gas, steam, water pressure, etc. by repositioning, blocking bleeding, or other suitable means.
3. Prior to starting work on equipment and after ensuring that no personnel are exposed, the authorized employee will verify that isolation and de-energization have been accomplished by:
    a. Attempting, through normal effort, to operate energy isolating devices such as switches, valves, or circuit breaker with locks or tags installed.
    b. Attempting to operate the equipment or machinery that is locked or tagged out. This includes all sources of energy, i.e. electrical, hydraulic, gravity, air, water, stream pressure, etc.
    c. Verifying the presence and effectiveness of restraint (blocking) and energy dissipation or release (bleeding).
4. If there is a possibility of the re-accumulation of stored energy to a hazardous level, verification of isolation will be contained until the servicing or

maintenance is completed, or until the possibility of such accumulation no longer exists.

D. Group Lockout/Tagout

1. When more than one individual is involved in locking or tagging equipment out of operation, each individual will attach their individual lock or tag, or the equivalent, to the energy isolating device(s).
    a. An equivalent lockout device may be in the form of a group lockout device such as a multiple lock hasp or lock box.
    b. Primary responsibility for a group of authorized employees working under a group lockout device will be vested in a designated authorized employee.
    c. Group lockout methods will provide a level of protection equal to that afforded by a personal lockout/tagout device.

II. RETURNING EQUIPMENT TO SERVICE

A. Restore Equipment to Normal Operating Status

1. Re-install all parts or subassemblies removed for servicing or maintenance.
2. Re-install all tools, rests, or other operating devices
3. Re-install all guards and protective devices (i.e. limit switches).
4. Remove all blocks, wedges, or other restraints from the operating area of the equipment (ways, slides, etc.).
5. Remove all tools, equipment, and shop towels from the operating area of the equipment.

B. Verify Equipment Ready for Operation

1. Inspect area for non-essential items
2. Ensure that all employees are safely positioned clear of the operating areas of the equipment. Post a watch if energy isolation devices are not in line of sight of the equipment.

C. Notify Affected Employees of Impending Start-up

1. The sudden noise of start-up may startle nearby employees.
2. Equipment may need to be tested to determine operational safety by a qualified operator.

D. Remove Energy Isolation Devices - Only by authorized employee(s) who installed it/them.

1. Remove line blanks, reconnect piping (if applicable), and remove warning tag.
2. Close bleeder valves, remove warning tag.
3. Replace fuse(s), close circuit breaker(s) and remove warning tag.
4. Remove lock and tag from control panel, valve, etc.

Employee(s) who installed them may make an exception for removal of lockout/tagout devices. If it is necessary to operate a piece of equipment that is locked/tagged out, <u>every</u> effort must be made to locate the employee whose lock or tag is on the equipment.

If he or she cannot be located and only after positive assurance is made that no one is working on the locked-out equipment, the supervisor may personally remove the lock. The supervisor must assure that the equipment is once again locked out, or the employee notified that the equipment has been re-energized, before the employee resumes work. Employees will recheck locked out equipment if they have left the equipment (breaks, lunch, and end of shift) to make sure it is still de-energized and locked out.

III. TEMPORARY REMOVAL OF LOCKOUT/TAGOUT PROTECTION

A. In situations when the equipment must be temporarily energized to test or position the equipment or its components, the following steps will be followed:

1. Clear the equipment of tools and materials that are non-essential to the operation.
2. Ensure the equipment components are operationally intact.
3. Remove employees from the equipment area.
4. Remove the lockout/tagout devices by the employee who installed in/them.
5. Energize and proceed with testing or positioning.
6. De-energize all systems and re-install all energy control measures.
7. Verify re-installed energy control measures are effective.

IV. SHIFT OR PERSONNEL CHANGES

A. The following steps will be followed to ensure continuity of employee protection during personnel changes.

1. All personnel involved in the maintenance or servicing activity will be notified that a transfer of personal locks/tags is about to occur.
2. Clear all personnel from hazardous area(s) of equipment.
3. Under the supervision of the shift supervisor or group designee, the off-going employee will immediately install theirs.
    a. If an entire group or more than one employee will be transferring work responsibility, locks/tags will be removed and replaced one at a time in order of installation.
4. When the transfer of lockout/tagout devices is complete, the effectiveness of all energy isolation devices will be verified to the satisfaction of all personnel involved.
5. Once the effectiveness of energy isolation protection is confirmed, the service/maintenance operation may continue.

V. CONTRACTOR NOTIFICATION

A. Whenever outside personnel may be engaged in activities covered by this program, they will inform the contractor of applicable lockout/tagout procedures used to protect Hydro Tech employees from the hazards of working near energized equipment.

1. The contractor will be expected to ensure that his/her employees understand and comply with the restrictions and prohibitions of this program.
2. Hydro Tech requires, under these circumstances, the contractor to inform us of their lockout/tagout procedures so that HTE employees can comply with the restrictions and prohibitions of the contractor's program.
3. Hydro Tech also requires the contractor to notify the program administrator, the area supervisor, and affected Hydro Tech employees prior to de-energizing, isolating and locking out Hydro Tech equipment. Conversely, notification is also required when this equipment will be returned to service.

DEFINITIONS

Affected employee - An employee whose job requires him/her to operate or use a machine or equipment on which servicing, or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized employee(s) - A person or persons who locks or implements a tagout system procedure to perform servicing or maintenance on a machine or equipment. An authorized employee and an affected employee may be the same person when the affected employee's duties also include performing maintenance or service on a machine or equipment that must be locked or tagged out.

"Capable of being locked out" - An energy isolating device will be considered to be capable of being locked out either if it is designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices will also be considered to be capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability.

Energized - Connected to an energy source or containing residual or stored energy.

Energy isolating device - A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a slide gate; a slip blind; a line

valve; a block; and any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

Energy source - any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other type of energy.

Lockout - The placement of lockout device on an energy-isolating device, in accordance with an established procedure, is ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device - A device that utilizes positive means such as a lock, either key or combination type, to hold an energy isolating device in the safety position and prevent the energizing of a machine or equipment.

Normal production operations - The utilization of a machine or equipment to perform its intended production function.

Servicing and/or maintenance - Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

Setting up - Any work performed to prepare a machine or equipment to perform its normal production operation.

Stored energy - Energy that is available and may cause movement even after energy sources have been isolated. Stored energy may be in the form of compressed springs, elevated equipment components, hydraulic oil pressure, pressurized water, air, steam, or gas, or rotating flywheels, shafts or cams.

Tagout - The placement of a tagout device on an energy-isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

GENERAL MACHINERY AND EQUIPMENT LIST

EQUIPMENT/LOCATION	ENERGY SOURCES/LOCATION
A. Backhoe Machine	Diesel Engine

5.0 Training

GENERAL HEALTH AND SAFETY TRAINING

In accordance with Hydro Tech corporate policy, and pursuant to 29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations. As a minimum, the training shall have consisted of instruction in the topics outlined in the above reference. Personnel who have not met the requirements for initial training will not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical).

Completion of the Hydro Tech Health and Safety Training Course for Hazardous Waste Operations or an approved equivalent will fulfill the requirements of this section. In addition to the required initial training, each employee shall have received 3 days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform.

The Hydro Tech SSO the responsibility of ensuring that personnel assigned to this project complies with these requirements. Written certification of completion of the required training will be provided to the SSO.

MANAGER/SUPERVISOR TRAINING

In accordance with 29 CFR 1910.120, onsite management and supervisors who will be directly responsible for, or who supervise employees engaged in hazardous waste operation shall receive training as required in this HASP and at least eight (8) additional hours of specialized training on managing such operations at the time of job assignment.

ANNUAL 8-HOUR REFRESHER TRAINING

Annual 8-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualification for fieldwork. The following topics will be reviewed: toxicology, respiratory protection, including air purifying devices and self-contained breathing apparatus (SCBA), medical surveillance, decontamination procedures and personnel protective clothing. In addition, topics deemed necessary by the SSO may be added to the above list.

SITE SPECIFIC TRAINING

Prior to commencement of field activities, all personnel assigned to the project will be provided training that will specifically address the activities, procedures, monitoring and equipment for the site operations. It will include Site and facility layout, hazards, and emergency services at the Site, and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

ONSITE SAFETY BRIEFINGS

Project personnel and visitors will be given periodic onsite health and safety briefings by the SSO, or their designee, to assist site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices or changes in the Site's environmental conditions. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety audits.

ADDITIONAL TRAINING

Additional training may be required by the SSO for participation in certain field tasks during the course of the project. Such additional training could be in the safe operation of heavy or power tool equipment or hazard communication training.

SUBCONTRACTOR TRAINING

Subcontractor personnel who work onsite, only occasionally, for a specific limited task and who are unlikely to be exposed over permissible exposure limits, may be exempted from the initial 40-hour training requirement. The SSO will determine if this exemption is allowed. In any case, the subcontractor personnel who are exposed to hazards are not

exempted from the 40-hours training requirement nor medical surveillance requirements found in Section 8.1.

6.0 Medical Surveillance

GENERAL

All contractor and subcontractor personnel performing field work at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120 (f). A physician's medical release for work will be confirmed by

the SSO before an employee can begin site activities. Such examinations shall include a statement as to the worker's present health status, the ability to work in a hazardous environment (including any required PPE which may be used during temperature extremes), and the worker's ability to wear respiratory protection.

A medical data sheet will be completed by all onsite personnel and kept at the Site. Where possible, this medical data sheet will accompany the personnel needing medical assistance or transport to hospital facilities.

MEDICAL SURVEILLANCE PROTOCOL
The medical surveillance protocol to be implemented is the occupational physicians' responsibility but shall meet the requirements of CFR 1910.120 and ANSI Z88.2 (1980). The medical surveillance protocol shall, as a minimum, cover the following:

a. Medical and Occupational History
b. General physical examination (including evaluation of major organ system)
c. Serum lead and ZPP
d. Chest X-ray (performed no more frequently that every four years, except when otherwise indicated).
e. Pulmonary Function Testing (FVC and FEV1.0).
f. Ability to wear respirator
g. Audiometric testing.

Additional clinical tests may be included at the discretion of the occupational physician.

7.0 Site Control, PPE & Communications

SITE CONTROL

A Support Zone (SZ) is an uncontaminated area that will be the field support area for most operations. The SZ 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. A contamination reduction corridor will be established. This is the route of entry and egress to the Site, and it provides an area for decontamination of personnel and portable equipment as well.

The area where contamination exists is considered to be the Exclusion Zone (EZ). All areas where excavation and handling of contaminated materials take place are considered the EZ. This zone will be clearly delineated by cones, tape or other means. The SSO 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
- Appropriate personal protective equipment
- Medical authorization
- Training certification

PERSONAL PROTECTIVE EQUIPMENT

GENERAL

The level of protection worn by field personnel will be enforced by the SSO. Levels of protection for general operations are provided below and are defined in this section. Levels of protection may be upgraded or downgraded at the discretion of the SSO. The decision shall be based on real-time air monitoring, site history data, and prior site experience. Any changes in the level of protection shall be recorded in the health and safety field logbook.

PERSONAL PROTECTIVE EQUIPMENT SPECIFICATIONS

For tasks requiring Level B PPE, the following equipment shall be used:

- Cotton or disposable coveralls
- Chemical protective suit (e.g. Saran-coated Tyvek®)
- Gloves, inner (latex)
- Gloves, outer (Nitrile®)
- Boots (PVC), steel toe/shank
- Boot Covers (as needed)
- Hard Hat
- Hearing protection (as needed)

For tasks requiring Level C PPE, the following equipment shall be used:

- Cotton or disposable coveralls
- Disposable outer coveralls (Poly-coated Tyvek)
- Gloves, inner (latex)
- Gloves, outer (Nitrile®)
- Boots (PVC), steel toe/shank
- Boot covers (as needed)
- Hard Hat
- Hearing protection (as needed)
- Splash suit and face shield for decontamination operations (as needed)

For tasks requiring Level D PPE, the following equipment shall be used:

- Cotton or disposable coveralls
- Gloves, inner (latex)
- Gloves, outer (Nitrile®)
- Boots (PVC) steel toe/shank
- Boot covers (as needed)
- Hard hat
- Hearing protection (as needed)
- Safety glasses

For tasks requiring respiratory protection, the following equipment shall be used:

Level D - No respiratory protective equipment necessary except for a dust mask
Level C - A full-face air-purifying respirator equipped with organic vapor/pesticide-HEPA cartridges
Level B - An airline respirator or a self-contained breathing apparatus (SCBA)

INITIAL LEVELS OF PROTECTION
Levels of protection for the activities may be upgraded or downgraded depending on direct-reading instruments or personnel monitoring. The following are the initial levels of protection that shall be used for each planned field activity.

LEVEL OF PERSONAL PROTECTIVE EQUIPMENT REQUIRED

Activity	**Level of Protection Respiratory/PPE**
Drilling/Coring	C/D
Sampling	C/D
Ground-Penetrating Radar/Magnetometer	C/D

COMMUNICATIONS

Communications is the ability to talk with others. While working in Level C/B Protection, personnel may find that communication becomes a more difficult task and process to accomplish. This is further complicated by distance and space. In order to address this problem, electronic instruments, mechanical devices or hand signals will be used as follows:

- Walkie-Talkies - Hand held radios would be utilized as much as possible by field teams for communication between downrange operations and the Command Post base station.

- Telephones - A mobile telephone will be located in the Command Post vehicle in the Support Zone for communication with emergency support services/facilities. If a telephone is demobilized, the nearest public phones will be identified.

- Air Horns - A member of the downrange field team will carry an air horn, and another will be evident in the Support Zone to alert field personnel to an emergency situation.

- Hand Signals - Members of the field team long with use of the buddy system will employ this communication method. Signals become especially important when in the vicinity of heavy moving equipment and when using Level B respiratory equipment. The signals shall become familiar to the entire field team before site operations commence and they will be reinforced and reviewed during site-specific training.

HAND SIGNALS FOR ONSITE COMMUNICATION

Signal	**Meaning**
Hand gripping throat	Out of air, can't breathe
Grip partners' wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up	OK, I'm all right; I understand
Thumbs down	No; negative, unable to understand you. I'm not all right

8.0 Air Monitoring Plan

GENERAL

Continuous air monitoring in the EZ during invasive tasks will accompany site operations, as indicated in this HASP or as required by the SSO. Monitoring will be performed to verify the adequacy of respiratory protection, to aid in site layout and to document work exposure. All monitoring instruments shall be operated by qualified personnel only and will be calibrated daily prior to use, or more often as necessary.

REAL-TIME MONITORING

INSTRUMENTATION
At least one (1) of the following monitoring instruments will be available for use during field operations as necessary:

- Photoionization Detector (PID), Rae Instruments with 10.2 EV probe or equivalent

- Flame Ionization Detector (FID), Foxboro Model 128 or equivalent

- Combustible Gas Indicator (CGI)/Oxygen (O_2) Meter, MSA or equivalent.

A FID or PID shall be used to monitor the organic vapor concentrations in active work areas. Organic vapor concentrations shall be measured upwind of the work areas to determine background concentrations. The SSO will interpret monitoring results using professional judgment. The PPE utilized shall always be the most protective, thus the action level criteria are flexible guidelines.

A CGI/O_2 meter shall be used to monitor for combustible gases and oxygen content in the boreholes during drilling activities.

Calibration records shall be documented and included in the health and safety logbook or instrument calibration logbook. All instruments shall be calibrated before and after each daily use in accordance with the manufacturers' procedures.

ACTION LEVELS
Action levels for upgrading of PPE in this HASP will apply to all site work during the duration of field activities at the Site. Action levels are for unknown contaminants using direct reading in the Breathing Zone (BZ) for organic vapors and dusts, and at the source for combustible gases.

MONITORING DURING FIELD ACTIVITIES
Hydro Tech shall perform real time air monitoring prior to the commencement of work to establish baseline conditions. Baseline conditions will be established at the approximate center of the Site and at the perimeter of the Site both upwind and downwind.

During all work activities real time monitoring will occur. As necessary, Hydro Tech shall have at each applicable workstation a PID, explosimeter and oxygen deficiency meter. The real time monitoring for remedial activities will be conducted approximating the Breathing Zone of the workers. The monitoring will be continuous during working operations.

The air-monitoring instrument may indicate that personnel working in the exclusion zone increase their level of protection. All personnel will be trained in the action levels. When conditions warrant an increase in protection, all personnel will stop working and immediately leave the exclusion zone. They will then don the appropriate safety equipment necessary and return to their current workstation. All of this activity will be monitored by the SSO. The SSO will keep the Hydro Tech Project Manager aware of any extraordinary situations and conditions that may occur. Working conditions and

monitoring levels will be noted in the Field Notebook along with the time, date and page number. Verbal reports will be given to the Project Manager when there is a change in the PPE level.

The previous day's results shall be reviewed each morning to determine what actions are necessary and the general conditions resulting from and around the Site.

The record keeping will include:

- Date & Time of Monitoring
- Air Monitoring Location
- Instrument, Model #, Serial #
- Calibration/Background Levels
- Results of Monitoring
- SSO Signature
- Comments

Excavation Operations - Monitoring will be performed continuously during all excavation and demolition operations. A PID and/or FID shall be utilized to monitor the breathing zone, the excavated area and any material taken from the excavation. A CGI/O_2 meter shall be used to monitor the excavation for the presence of combustible gases.

ACTION LEVELS OF AIRBORNE CONTAMINANTS

Instrument	Action Level	Action to be taken
FID/PID	< 100 ppm, for a 15-minute average	Stop work & initiate vapor control
	> 100 ppm, for a 15-minute average	Stop work & initiate evacuation procedure
CGI	10% LEL	Stop work, initiate ventilating
	50% LEL	Stop work, initiate evacuation procedure and contact fire dept.

PERSONNEL MONITORING PROCEDURE

The Site SSO, concurrent with activities that may generate the contaminants in excess of OSHA PEL's, may perform assessment and evaluation of field personnel exposures to airborne contaminants.

Procedures to be followed include:

The SSO may select high-risk individuals who may be subject to contaminant exposure based on job assignment.

The Personal Sampling is being conducted to determine the proper levels of respiratory protection required, to document potential exposures to compounds, and to assure compliance with OSHA standards. Therefore, it is important that the data collected be from "worst case" locations and personnel.

For example: when work is being conducted to excavate at an underground tank location, those persons closest to the excavation and most intimately involved with the work should be sampled. If a backhoe operator solely conducted the excavation, then that employee should be monitored. However, if there are additional workers who must enter the excavation and work with the freshly excavated soil, these persons would be closer to the potential contaminants and they should be sampled.

To meet the intent of the sampling will require sampling at periods of the most disturbances. To be accurate in determining potential exposures, as many tasks/trades shall be sampled as possible during the course of this project. At completion of the project, a goal of 20% of all workers who must perform their duties in or around the contaminated soil, tanks and excavations is sought.

Hydro Tech must provide all sampling data in writing to the employees within three (3) days of receipt of results.

Air sampling pumps used to collect employee exposure samples shall be calibrated before and after use each day. Calibration shall be accomplished using a primary standard calibration system, e.g. the bubble tube method. Results of the calibrations shall be included in the health and safety field logbook and with the exposure report.

Chemical analysis of samples collected for assessment of employee exposures shall be performed in accordance with NIOSH or OSHA analytical methods only by laboratories accredited by the American Industrial Hygiene Association.

Results of the personal exposure assessment shall be provided to the individual, in writing within fifteen (15) working days after receipt of laboratory reports. Reports to field personnel shall provide calculated time-weighted average exposures and shall provide comparative information relative to established permissible exposure limits. The air sampling data sheet and laboratory report is considered a part of the employee exposure report. A copy of the employee personal exposure assessment report shall also be included in the project file and the employees' medical record for Hydro Tech

employees. Reports for subcontractor employees will be sent directly to the subcontractors' employer.

AIR MONITORING REPORTS

Air Monitoring Reports will be completed by the SSO and/or authorized personnel and submitted to the Project Manager in the daily safety logs and will include the following:

- Date of monitoring
- Equipment utilized for air monitoring
- Real-time air monitoring results from each work location
- Calibration method of equipment and results

9.0 Safety Considerations

GENERAL

In addition to the specific requirements of this HASP, common sense should be used at all times. The general safety rules and practices below will be in effect at the Site at the discretion of the Project Manager, SSO or other authorized personnel.

- The site will be suitably marked or barricaded as necessary to prevent unauthorized visitors but not hinder emergency services if needed.

- As needed, all open holes, trenches and obstacles will be properly barricaded in accordance with local site requirements. These requirements will be determined by proximity to traffic ways, both pedestrian and vehicular, and site of the hole, trench or obstacle. If holes are required to be left open during non-working hours, they will be adequately decked over or barricaded and sufficiently lighted.

- Before any digging or boring operations are conducted, underground utility locations will be identified. All boring, excavation and other site work will be planned and performed with consideration for underground lines. Any excavation work will be performed in accordance with Hydro Tech's Standard Operating Procedures for Excavations.

- Either workers or other people will enact dust-mitigating procedures when there exists the potential for the inhalation of dust particles.

- The act of smoking and ignition sources in the vicinity of potentially flammable or contaminated material is strictly prohibited.

- Drilling, boring, and use of cranes and drilling rigs, erection of towers, movement of vehicles and equipment and other activities will be planned and performed with consideration for the location, height, and relative position of aboveground utilities and fixtures, including signs; canopies; building and other structures and construction; and natural features such as trees, boulders, bodies of water, and terrain.

- When working in areas where flammable vapors may be present, particular care shall be exercised with tools and equipment that may be sources of ignition. All tools and equipment provided must be properly bonded and/or grounded. Metal buttons and zippers are prohibited on safety clothing for areas that may contain a flammable or explosive atmosphere.

- Approved and appropriate safety equipment (as specified in this HASP), such as eye protection, hard hats, foot protection, and respirators, must be worn in areas where required. In addition, eye protection must be worn when sampling soil or water that may be contaminated.

- Beards interfere with respirator fit and are not allowed within the site boundaries because all site personnel may be called upon to use respirator protection is some situations.

- No smoking, eating, chewing tobacco, gum chewing, or drinking will be allowed in the contaminated areas.

- Contaminated tools and hands must be kept away from the face.

- Personnel must use personal hygiene safeguards (washing up) at the end of the shift or as soon as possible after leaving the Site.

- Each sample must be treated and handled as though it were contaminated.

- Persons with long hair and/or loose-fitting clothing that could become entangled in power equipment must take adequate precautions.

- Horseplay is prohibited in the work area.

- Work while under the influence of intoxicants, narcotics or controlled substances is prohibited.

POSTED SIGNS

Posted danger signs will be used where an immediate hazard exists. Caution signs will be posted to warn against potential hazards and to caution against unsafe practices. Traffic control methods and barricades will be used as needed. Wooden stakes and flagging tape, or equally effective material will be used to demarcate all restricted areas.

Other postings may include the OSHA poster, emergency hospital route and telephone numbers of contact personnel.

INVASIVE OPERATIONS

The SSO will be present onsite during all invasive work (e.g. demolition, excavations). The SSO will ensure that appropriate levels of protection and safety procedures are followed. No personnel will enter any excavations for any reasons. All personnel will stay at least 10 feet back from the edge of the excavation and out of the swing radius of the backhoe. No drums or other potential sources will be sampled or removed during this phase without further additions to the HASP.

The proximity of water, sewer and electrical lines will be identified prior to invasive operations. The possibility of the presence of underground conduits or vessels containing materials under pressure will also be investigated prior to invasive operations. Properly sized containment systems will be utilized, and consideration of the potential volume of liquid or waste released during operations will be discussed with members of the field team to minimize the potential for spills and provide a method for collection of waste materials. Emergency evacuation procedures and the location of safety equipment will be established prior to start up operations. The use of protective clothing, especially hard hats, boots, and gloves will be required during drilling and other heavy equipment work.

SOIL AND GROUNDWATER SAMPLING

Personnel must wear prescribed protective clothing and equipment including eye protection, chemical resistant gloves and splash aprons (where appropriate) when sampling solids and liquids. Sample bottles are to be bagged prior to sampling to ease decontamination. Personnel must be aware of the location of emergency equipment, including spill containment materials prior to sampling. Personnel are to practice contamination avoidance at all times, as well as to utilize the buddy system and maintain communications with the Command Post.

SAMPLE HANDLING

Personnel responsible for the handling of samples will wear the prescribed level of protection. Samples are to be identified as to their hazard and packaged as to prevent spillage or breakage. Any unusual sample conditions shall be noted. Laboratory personnel and all field personnel shall be advised of sample hazard levels and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or including a written statement with the samples reviewing lab safety procedures in handling in order to assure that the practices are appropriate for the suspected contaminants in the sample.

HEAVY EQUIPMENT DECONTAMINATION

Personnel steam cleaning heavy equipment shall use the prescribed level of protection and adhere to the buddy system. Initially this task usually employs level C. The heavy equipment decontamination shall be restricted to authorized personnel only. Special consideration will be given to wind speed and direction. Downwind areas are to be kept free of personnel to avoid unnecessary exposure to potential airborne contamination.

ADDITIONAL SAFETY CONSIDERATIONS

No other additional safety considerations at this time.

10.0 Decontamination and Disposal Procedures

CONTAMINATION PREVENTION

One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention should minimize worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

<u>Personnel:</u>
Do not walk through areas of obvious or known contamination
Do not directly handle or touch contaminated materials
Make sure that there are no cuts or tears on PPE
Fasten all closures in suits; cover with tape if necessary
Particular care should be taken to prevent any skin injuries
Stay upwind of airborne contaminants
Do not carry cigarettes, cosmetics, gum, etc. into contaminated areas

Sampling and Monitoring:
When required by the SSO, cover instruments with clear plastic, leaving openings for sampling ports and bag sample containers prior to emplacement of sample material.

Heavy Equipment:
Care should be taken to limit the amount of contamination that comes in contact with heavy equipment (tires, contaminated augers). Dust control measures may be needed on roads inside the site boundaries.

PERSONNEL DECONTAMINATION

All personnel shall pass through an outlined decontamination procedure when exiting the hot zone at each location. Field washes for equipment and PPE shall be set up at each drilling location. The system will include a gross wash and rinse for all disposable clothing and boots worn in the EZ. Upon exiting the EZ, all personnel will wash their hands, arms, neck, and face before entering the Support Zone.

EQUIPMENT DECONTAMINATION

Equipment used at the Site that is potentially contaminated shall be decontaminated to prevent hazardous materials from leaving the Site. All heavy equipment will be decontaminated at the decontamination pad and inspected by the SSO and Project Manager before it leaves the Site. The decontamination area will

provide for the containment of all wastewater from the decontamination process. Respirators, airline and any other personnel equipment that comes in contact with contaminated soils shall pass through a field wash.

DECONTAMINATION DURING MEDICAL EMERGENCIES

If emergency lifesaving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or omitted. The Site SSO or desigee will accompany contaminated victims to the medical facility to advice on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances and /or medical personnel. Outer garments are then removed at the medical facility.

No attempt will be made to wash or rinse the victim, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material that

could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed. Note that heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Less serious forms of heat stress also require prompt attention and removal of protective clothing immediately; unless the victim is obviously contaminated, decontamination should be omitted or minimized, and treatment begun immediately.

DISPOSAL PROCEDURES

A segregating system of non-hazardous waste and hazardous waste will be developed by the SSO and PM. All discarded material, waste materials or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating sanitary hazards, or causing litter to be left on site. All potentially contaminated materials, e.g. clothing, gloves, etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials shall be collected and bagged for appropriate disposal as normal domestic waste.

11.0 Emergency Plan

The potential for the development of an emergency situation is low considering the low concentrations of hazardous substances at the work site. Nevertheless, an emergency situation could occur. All Hydro Tech and subcontractor field team members prior to the start of work will know the emergency plan outlined in this section. The emergency plan will be available for use at all times during site work.

Various individual site characteristics will determine preliminary actions taken to assure that this emergency plan is successfully implemented in the event of a site emergency. Careful consideration must be given to the proximity of neighborhood housing or places of employment, and to the relative possibility of site fire, explosion or release of vapors or gases that could affect the surrounding community.

The Project Manager shall make contact with local fire, police and other emergency units prior to beginning work on site. In these contacts, the Project Manager will inform the emergency units about the nature and duration of work expected to the Site and the type of contaminants and the possible health or safety effects of emergencies involving these contaminants. At this time, the Project Manager and the emergency response units shall make the necessary arrangements to be prepared for any emergencies that could occur.

The Project Manager shall implement the contingency plan whenever conditions at the Site warrant such action. The Project Manager will be responsible for coordination of the evacuation emergency treatment, and transportation of site personnel as necessary, and notification of emergency response units and the appropriate management staff.

The cases where the PM is not available, the SSO shall serve as the alternate emergency coordinator.

EVACUATION

In the event of an emergency situation, such as fire, explosion, or significant release of toxic gases, an air horn or other appropriate device will be sounded for approximately 10 second intervals indicating the initiation of evacuation procedures. All personnel will evacuate and assemble near the entrance to the site. The location shall be upwind of the Site where possible.

For efficient and safe site evacuation and assessment of the emergency situation, the Project Manager will have authority to initiate action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The SSO or designated SSO must ensure that access for emergency equipment is provided and that all combustion apparatuses have been shut down once the alarm has been sounded. Once the safety of all personnel is established, the Fire Department and other emergency response groups as necessary will be notified by telephone of the emergency.

POTENTIAL OR ACTUAL FIRE OR EXPLOSION

Immediately evacuate the Site (air horn will sound for 10-second intervals), notify the local fire and police departments, and other appropriate emergency response groups if an actual fire or explosion has taken place.

PERSONNEL INJURY

Emergency first aid shall be applied on site as deemed necessary. If necessary, the individual shall be decontaminated and transported to the nearest medical facility.

The ambulance/rescue squad shall be contacted for transport as necessary in an emergency. However, since some situations may require transport of an injured party by other means, the hospital route is identified below. A map to this facility provided with this HASP in Section 2.2.3.

ACCIDENT/INCIDENT REPORTING

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

1. Mark E. Robbins-Cell phone (631) 457-0030
2. The employer of any injured worker if not a HydroTech employee

Written confirmation of verbal reports is to be submitted within 24 hours. The report form entitled "Accident Data Report" is to be used for this purpose. All Hydro Tech representatives contacted by telephone are to receive a copy of this report. If the employee involved is not a Hydro Tech employee, his employer shall receive a copy of this report.

For reporting purposes, the term accident refers to fatalities, lost time injuries, spill or exposure to hazardous materials (toxic materials, explosive or flammable materials). Any information released from the health care provider, which is not deemed confidential patient information, is to be attached to the appropriate form. Any medical information that is released by patient consent is to be filed in the individuals' medical records and treated as confidential.

OVERT PERSONNEL EXPOSURE

SKIN CONTACT:	Use copious amounts of soap and water. Wash/rinse affected area thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination.
INHALATION:	Move personnel to fresh air and if necessary, decontaminate and transport to hospital.
INGESTION:	Decontamination and transport to emergency medical facility.
PUNCTURE WOUND OR LACERATION:	Decontaminate and transport to emergency medical facility.

ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the SSO or designee 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
- Potential for electrical storms

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lighting. Observe daily weather reports and evacuate if necessary, in case of inclement weather conditions.

EMERGENCY RESPONSE EQUIPMENT LIST

Some or all of the following will either be available onsite or be able to be brought to the Site within a 2-hour period:

- 55 Gallon Drums
- 85 Gallon Drums
- Absorbent Pads
- Absorbent Booms
- Speedy-Dry
- Plastic Sheeting
- Hay Bales
- Pneumatic Nibbler
- Backhoe
- Pressure Washer
- Air Compressor
- Wilden Pumps
- Equipment Storage Trailer
- Submersible Pumps
- Miscellaneous Hand Tools
- Portable Lighting

LARGE EQUIPMENT

If necessary, Hydro Tech can have the following large equipment brought to the Site within 2-hours:

- Large Vacuum Truck
- Super Sucker
- Dump Trucks
- Drill Rig
- Utility Vehicle

12.0 Logs, Reports and Record Keeping

MEDICAL AND TRAINING RECORDS

The employer keeps medical and training records. All subcontractors must provide verification of training and medical qualifications to the SSO. The SSO will keep a log of personnel meeting appropriate training and medical qualifications for site work. The log will be kept in the project file. Medical records will be maintained in accordance with 29 CFR 1910.20.

ONSITE LOG

A log of personnel onsite each day will be kept by the SSO or designee. A copy of these logs will be sent to the Hydro Tech records coordinator for data entry. Originals will be kept in the project file.

EXPOSURE RECORDS

Any personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be kept in accordance with 29 CFR 1910.20. For Hydro Tech employees, the originals will be sent to the Hydro Tech records coordinator. For subcontractor employees, the original will be sent to the subcontractor employer and a copy kept in the project file.

ACCIDENT/INCIDENT REPORTS

An accident/incident report must be completed for all accidents and incidents. Hydro Tech will send the originals to the appropriate Hydro Tech records coordinator for maintenance. Copies will be distributed as stated. A copy of the forms will be kept in the project file.

OSHA FORM 200

An OSHA Form 200 (Log of Occupational Injuries and Illnesses) will be kept at the Site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the Hydro Tech corporate records administrator for

maintenance. Subcontractor employers must also meet the requirements of maintaining an OSHA 200 form.

The Hydro Tech accident/incident report meets the requirements of the OSHA Form 101 (Supplemental Record) and must be maintained with the OSHA Form 200 for all recordable injuries or illnesses.

HEALTH AND SAFETY FIELD LOGBOOK

The SSO or designee will maintain the logbook in accordance with standard Hydro Tech procedures. Daily site conditions, activities, personnel, calibration records, monitoring results and significant events will be recorded. The original logbooks will become part of the exposure records file.

13.0 Sanitation

If sanitary sewers are not provided at the Site, provisions shall be made for access to sanitary systems by using nearby public facilities consistent with provisions of governing local ordinance codes. In the latter case, provisions are required for the removal of accumulated waste products within those units.

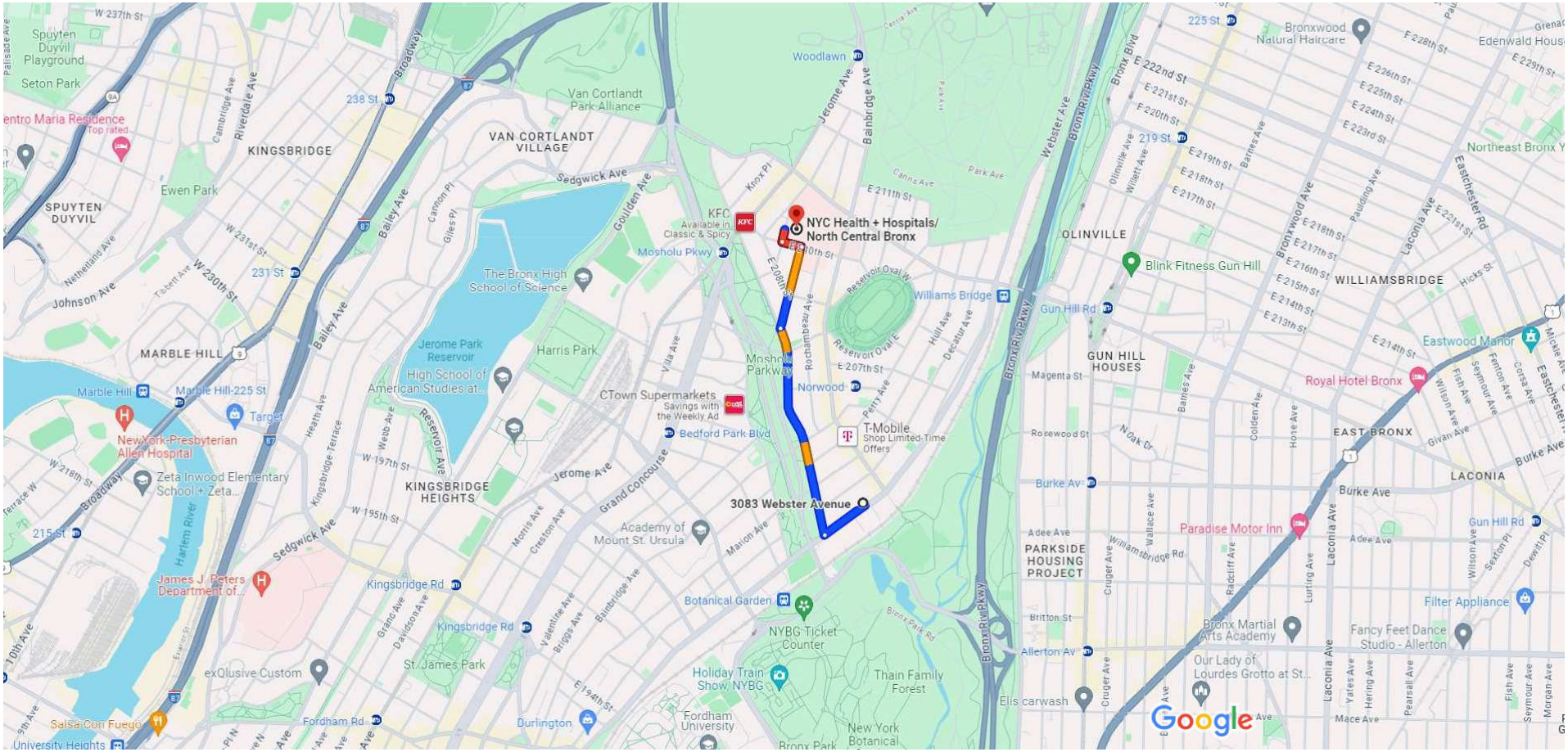
If a commercial/industrial laundry is used to clean or launder clothing that is potentially contaminated, they shall be informed of the potential harmful effects of exposure to hazardous substances related to the affected clothing.

Personnel and subcontractors' sites shall follow decontamination procedures described in the HASP, or as directed by the SSO. This will generally include at a minimum site-specific training in shower usage and cleanup, personal hygiene requirements and the donning of protective equipment/clothing.

Google Maps

3083 Webster Ave, Bronx, NY 10467 to NYC Health + Hospitals/North Ctr'l Bronx, 3424 Kossuth Ave, Bronx, NY 10467

Drive 0.9 mile, 6 min



Map data ©2024 Google 1000 ft

3083 Webster Ave
Bronx, NY 10467

1. Head southwest on Webster Ave toward E 202nd St

0.1 mi

2. Turn right onto E Mosholu Pkwy N

0.5 mi

3. Turn right onto Steuben Ave

0.2 mi

4. Turn left onto E 210th St

259 ft

5. Turn right onto Kossuth Ave

Destination will be on the right

154 ft

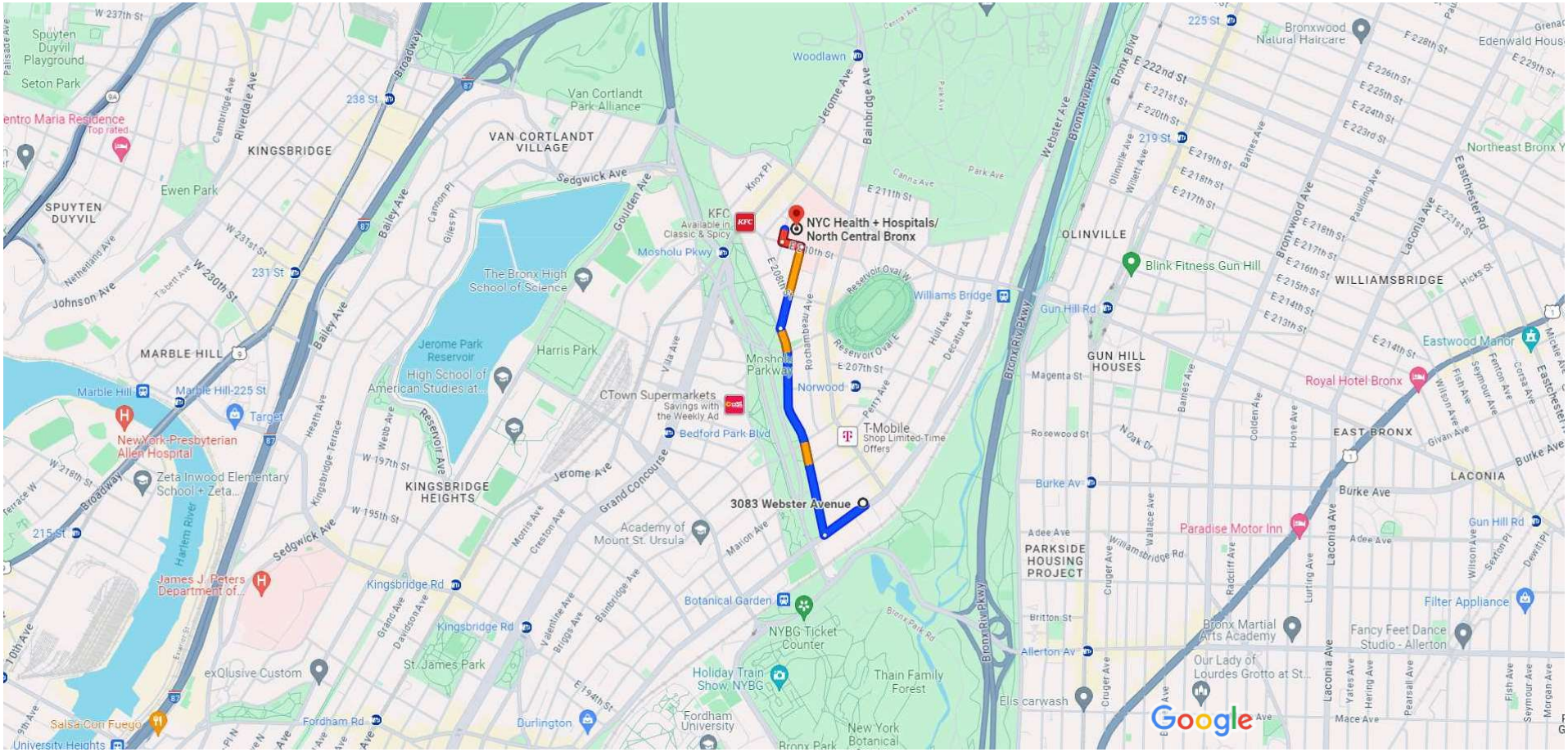
NYC Health + Hospitals/North Ctr'l Bronx
3424 Kossuth Ave, Bronx, NY 10467

FIGURE 1
DIRECTIONS TO HOSPITAL

Google Maps

3083 Webster Ave, Bronx, NY 10467 to NYC Health + Hospitals/North Ctr'l Bronx, 3424 Kossuth Ave, Bronx, NY 10467

Drive 0.9 mile, 6 min



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Destination will be on the right

154 ft

NYC Health + Hospitals/North Ctr'l Bronx
3424 Kossuth Ave, Bronx, NY 10467

ATTACHMENT A
ACCIDENT/INCIDENT REPORT LOG

Accident / Incident Reporting Log

Unit:	Chartering Organization:

INFORMATION ON PERSON IN CHARGE OF THE GROUP

Name:		
Address:		
Phone numbers:	Home:	Work:
	Fax:	E-Mail:

INFORMATION ON THE INCIDENT

Nature of the activity:	
Place of the activity:	
Date of the incident:	Time of the incident:
Exact location of the incident:	
Weather Conditions (if applicable):	
Name of Person in charge at the time:	
Description of incident (if machinery involved, list owner and operator and details on incident)	

Witness Name:	Home Phone:	Work Phone:
Witness Name:	Home Phone:	Work Phone:

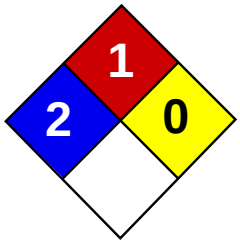
COMPLETE ONLY IF THIS INCIDENT WAS REPORTED TO THE NYPD or FDNY

Station Name, Number:
Station Address:
Name and Phone Number of Officer in Charge:

INFORMATION ON INJURED PERSON OR OWNER OF DAMAGED PROPERTY		
Name:		Birth date:
Address:		
Phone Numbers:	Home:	Work:
Please describe nature of injury or property damage		
Complete if applicable:	Name of doctor consulted:	Phone:
Complete if applicable:	Name and address of hospital or clinic:	Phone:

REPORTING DETAILS		
This report must be signed by person in charge of Site Operations at time of incident including Site Supervisor, or Project Manager or Site Safety officer	Print full name:	
	Position:	
	Street Address:	
	Town, State, Zip:	
	Telephone (Home)	(work)
	Fax:	Email:
	Signature:	Date:

ATTACHMENT B
HEALTH AND SAFETY FACT SHEETS



Material Safety Data Sheet
Trichloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Trichloroethylene

Catalog Codes: SLT3310, SLT2590

CAS#: 79-01-6

RTECS: KX4560000

TSCA: TSCA 8(b) inventory: Trichloroethylene

CI#: Not available.

Synonym:

Chemical Formula: C2HCl3

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
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 420°C (788°F)

Flash Points: Not available.

Flammable Limits: LOWER: 8% UPPER: 10.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. 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 away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/

spray. Wear suitable protective clothing 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

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

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:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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:
TWA: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 131.39 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 86.7°C (188.1°F)

Melting Point: -87.1°C (-124.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.4649 (Water = 1)

Vapor Pressure: 58 mm of Hg (@ 20°C)

Vapor Density: 4.53 (Air = 1)

Volatility: Not available.

Odor Threshold: 20 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity:
Extremely corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

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 more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Trichloroethylene : UN1710 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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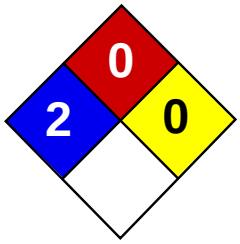

Health	2
Fire	0
Reactivity	0
Personal Protection	G

Material Safety Data Sheet
Tetrachloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrachloroethylene

Catalog Codes: SLT3220

CAS#: 127-18-4

RTECS: KX3850000

TSCA: TSCA 8(b) inventory: Tetrachloroethylene

CI#: Not available.

Synonym: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolvel; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

Chemical Name: Ethylene, tetrachloro-

Chemical Formula: C2-Cl4

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
Tetrachloroethylene	127-18-4	100

Toxicological Data on Ingredients: Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

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. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

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. Seek medical attention.

Ingestion:
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 if symptoms appear.

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: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. 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:
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

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.

Personal Protection:
Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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:
TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal.

Taste: Not available.

Molecular Weight: 165.83 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 121.3°C (250.3°F)

Melting Point: -22.3°C (-8.1°F)

Critical Temperature: 347.1°C (656.8°F)

Specific Gravity: 1.6227 (Water = 1)

Vapor Pressure: 1.7 kPa (@ 20°C)

Vapor Density: 5.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 5 - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.4

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium , barium. Protect from light.

Special Remarks on Corrosivity: Slowly corrodes aluminum, iron, and zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Publishe Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects(teratogenic). May affect genetic material (mutagenic). May cause cancer.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symtoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorentiation, seizures, enotional instability, stupor, coma). It may cause pulmonary edema Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver(hepatitis,fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/ central nervous system/peripheral nervous system (impaired memory, numbness of extremeties, peripheral neuropathy and other

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fatthead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

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 product itself and its products of degradation are not toxic.

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 6.1: Poisonous material.

Identification: : Tetrachloroethylene UNNA: 1897 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 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-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: g

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/01/2010 12:00 PM

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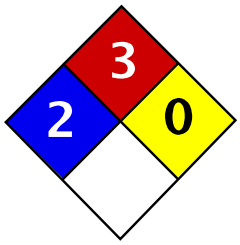

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
p-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: p-Xylene

Catalog Codes: SLX1120

CAS#: 106-42-3

RTECS: ZE2625000

TSCA: TSCA 8(b) inventory: p-Xylene

CI#: Not applicable.

Synonym: p-Methyltoluene

Chemical Name: 1,4-Dimethylbenzene

Chemical Formula: C6H4(CH3)2

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
{p-}Xylene	106-42-3	100

Toxicological Data on Ingredients: p-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 12400 mg/kg [Rabbit.]. VAPOR (LC50): Acute: 4550 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. 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:
Hazardous in case of skin contact (irritant), of eye contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to blood, kidneys, the nervous system, liver.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water.
Keep away from heat. Keep away from sources of ignition. 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. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. 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.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

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:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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:
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV)
TWA: 434 STEL: 651 (mg/m3) from ACGIHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 138°C (280.4°F)

Melting Point: 12°C (53.6°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 9 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Easily soluble in methanol, diethyl ether.
Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 5000 mg/kg [Rat.].
Acute dermal toxicity (LD50): 12400 mg/kg [Rabbit.].
Acute toxicity of the vapor (LC50): 4550 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier.
0900 Detected in maternal milk in human.
Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

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 more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: p-Xylene
Florida: p-Xylene
Massachusetts RTK: p-Xylene
New Jersey: p-Xylene
TSCA 8(b) inventory: p-Xylene
SARA 313 toxic chemical notification and release reporting: p-Xylene
CERCLA: Hazardous substances.: p-Xylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R10- Flammable.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.
R48/20- Harmful: danger of serious

damage to health by prolonged exposure through inhalation.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec.
-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 rÃ¨glement sur le transport des marchandises dangeureuses au canada. Centre de conformitÃ© internatinal LtÃ©e. 1986.

Other Special Considerations: Not available.

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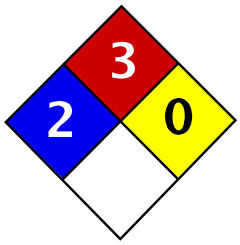

Health	2
Fire	3
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
m-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: m-Xylene

Catalog Codes: SLX1066

CAS#: 108-38-3

RTECS: ZE2275000

TSCA: TSCA 8(b) inventory: m-Xylene

CI#: Not applicable.

Synonym: m-Methyltoluene

Chemical Name: 1,3-Dimethylbenzene

Chemical Formula: C6H4(CH3)2

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
{m-}Xylene	108-38-3	100

Toxicological Data on Ingredients: m-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit.].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. 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:
Hazardous in case of skin contact (irritant), of eye contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to blood, kidneys, the nervous system, liver.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid, insoluble in water.

Keep away from heat. Keep away from sources of ignition. 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. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. 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.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

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: Splash goggles. Lab coat. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV)
TWA: 434 STEL: 651 (mg/m3) from ACGIHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 139.3°C (282.7°F)

Melting Point: -47.87°C (-54.2°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 6 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Easily soluble in methanol, diethyl ether.
Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:
Acute oral toxicity (LD50): 5000 mg/kg [Rat.].
Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit.].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier.
0900 Detected in maternal milk in human.
Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

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 more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: m-Xylene
Massachusetts RTK: m-Xylene
TSCA 8(b) inventory: m-Xylene
SARA 313 toxic chemical notification and release reporting: m-Xylene
CERCLA: Hazardous substances.: m-Xylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R10- Flammable.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec.
-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 rÃ¨glement sur le transport des marchandises dangeureuses au canada. Centre de conformitÃ© internatinal LtÃ©e. 1986.

Other Special Considerations: Not available.

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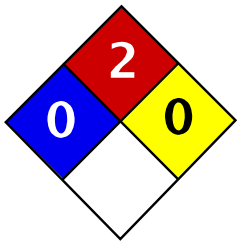

Health	0
Fire	2
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Mesitylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mesitylene

Catalog Codes: SLM2410

CAS#: 108-67-8

RTECS: OX6825000

TSCA: TSCA 8(b) inventory: Mesitylene

CI#: Not available.

Synonym: 1,3,5-Trimethylbenzene

Chemical Formula: C9H12

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
Mesitylene	108-67-8	100

Toxicological Data on Ingredients: Mesitylene: VAPOR (LC50): Acute: 4881.9 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation (lung irritant). Slightly hazardous in case of skin contact (irritant, permeator), .

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes,

keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 559°C (1038.2°F)

Flash Points: CLOSED CUP: 43°C (109.4°F).

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Avoid contact with eyes Wear suitable protective clothing If ingested, seek medical advice immediately and show the container or the label.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

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:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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:
TWA: 25 CEIL: 35 (ppm)
TWA: 125 CEIL: 170 (mg/m3)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 120.2 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 164.7°C (328.5°F)

Melting Point: -44.8°C (-48.6°F)

Critical Temperature: Not available.

Specific Gravity: 0.8637 (Water = 1)

Vapor Pressure: 1.86 mm of Hg (@ 20°C)

Vapor Density: 4.14 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.23 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute toxicity of the vapor (LC50): 4881.9 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation (lung irritant).
Slightly hazardous in case of skin contact (irritant, permeator), .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

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 more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : 1,3,5-Trimethylbenzene : UN2325 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Florida: Mesitylene
New Jersey: Mesitylene
TSCA 8(b) inventory: Mesitylene

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 B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).

DSCL (EEC):
R10- Flammable.
R36/37- Irritating to eyes and respiratory system.

HMIS (U.S.A.):

Health Hazard: 0

Fire Hazard: 2

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

BENZO(B)FLUORANTHENE
Benzo(e)acephenanthrylene
2,3-Benzofluoroanthene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 205-99-2
RTECS # CU1400000
ICSC # 0720

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• **EYES**		Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Tightly closed.	Unbreakable packaging; put breakable packaging into closed unbreakable container.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0720

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Melting point: 168°C Solubility in water: none	Vapour pressure, Pa at 20°C: <10 Octanol/water partition coefficient as log Pow: 6.04
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0720 **BENZO(B)FLUORANTHENE**

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International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

BENZO(K)FLUOROANTHENE
11,12-Benzofluoroanthene
Dibenzo(b,j,k)fluorene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 207-08-9
RTECS # DF6350000
ICSC # 0721

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• **EYES**		Safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Tightly closed.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0721

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International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts with strong oxidants. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 215.7°C	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0721 **BENZO(K)FLUORANTHENE**

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International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

BENZ(a)ANTHRACENE
1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene
$C_{18}H_{12}$
Molecular mass: 228.3

CAS # 56-55-3
RTECS # CV9275000
ICSC # 0385
EC # 601-033-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**		Safety goggles, face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Well closed.	T symbol R: 45 S: 53-45

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0385

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International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS TO YELLOW-BROWN FLUORESCENT FLAKES OR POWDER.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Sublimation point: 435°C
Melting point: 162°C
Relative density (water = 1): 1.274
Solubility in water: none
Vapour pressure, Pa at 20°C: 292
Octanol/water partition coefficient as log Pow: 5.61

ENVIRONMENTAL DATA

In the food chain important to humans, bioaccumulation takes place, specifically in seafood.

NOTES

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name.

ADDITIONAL INFORMATION

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Material Safety Data Sheet

Benzo[a]pyrene, 98%

ACC# 37175

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzo[a]pyrene, 98%
Catalog Numbers: AC105600000, AC105600010, AC105601000, AC377200000, AC377200010, AC377201000 AC377201000
Synonyms: 3,4-Benzopyrene; 3,4-Benzpyrene; Benzo[def]chrysene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
50-32-8	Benzo[a]pyrene	>96	200-028-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow to brown powder.
Danger! May cause harm to the unborn child. May impair fertility. May cause eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Cancer hazard. May cause allergic skin reaction. May cause heritable genetic damage.
Target Organs: Reproductive system, skin.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation. May be harmful if absorbed through the skin. May cause an allergic reaction in certain individuals.
Ingestion: May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May be harmful if swallowed.
Inhalation: May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. May be harmful if inhaled.
Chronic: May cause cancer in humans. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs

Benzo[a]pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Benzo[a]pyrene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Powder
Appearance: yellow to brown
Odor: faint aromatic odor
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 495 deg C @ 760 mm Hg
Freezing/Melting Point:175 - 179 deg C
Decomposition Temperature: Not available.
Solubility: 1.60x10-3 mg/l @25°C
Specific Gravity/Density: Not available.
Molecular Formula:C20H12
Molecular Weight:252.31

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 50-32-8: DJ3675000
LD50/LC50:

Not available.

Carcinogenicity:
CAS# 50-32-8:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: Mutagenic effects have occurred in humans.Mutagenic effects have occurred in experimental animals.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 50-32-8: waste number U022.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NOT REGULATED FOR DOMESTIC TRANSPORT	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOL (Benzo{a} pyrene)
Hazard Class:		9
UN Number:		UN3077
Packing Group:		III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 50-32-8 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 50-32-8: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 50-32-8: immediate, delayed.

Section 313

This material contains Benzo[a]pyrene (CAS# 50-32-8, >96%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Benzo[a]pyrene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 50-32-8: 0.06 æg/day NSRL

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 43 May cause sensitization by skin contact.
R 45 May cause cancer.
R 46 May cause heritable genetic damage.
R 60 May impair fertility.
R 61 May cause harm to the unborn child.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou
s waste.
S 61 Avoid release to the environment. Refer to special instructions
/safety data sheets.

WGK (Water Danger/Protection)
CAS# 50-32-8: No information available.

Canada - DSL/NDSL
CAS# 50-32-8 is listed on Canada's DSL List.

Canada - WHMIS
This product has a WHMIS classification of D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List
CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #7 Date: 6/30/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet

Chrysene, 98%

ACC# 95251

Section 1 - Chemical Product and Company Identification

MSDS Name: Chrysene, 98%
Catalog Numbers: AC224140000, AC224140010, AC224140050, AC224145000
Synonyms: 1,2-Benzophenanthrene; Benzo(a)phenanthrene; 1,2,5,6-Dibenzonaphthalene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
218-01-9	Chrysene	98	205-923-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: very light beige solid.
Caution! May cause eye and skin irritation. May cause respiratory tract irritation. May cause cancer in humans.
Target Organs: Liver, skin.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: May cause respiratory tract irritation.
Chronic: May cause cancer according to animal studies.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air

immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: ; Flammability: 1; Instability:

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash hands before eating. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Avoid breathing dust.
Storage: Store in a tightly closed container. Store in a cool, dry area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chrysene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Chrysene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: very light beige
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 448 deg C @ 760 mm Hg
Freezing/Melting Point:250-255 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density: Not available.
Molecular Formula:C18H12
Molecular Weight:228.29

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 218-01-9: GC0700000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 218-01-9:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans

- **California:** carcinogen, initial date 1/1/90
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Chrysene was mutagenic to S. Typhimurium in the presence of an exogenous metabolic system.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Water flea LC50 = 1.9 mg/L; 2 Hr.; Unspecified Fish toxicity : LC50 (96hr) Neauthes arenacedentata >1ppm.(Rossi,S.S. et al Marine Pollut. Bull. 1978) Invertebrate toxicity : lethal treshold concentration (24hr) Daphnia Magna 0,7æg/l.(* Newsted,J.L. et al Environ. Toxicol. Chem. 1987) Bioaccumulation : 24hr Daphnia Magna log bioconcentration factor 3.7845 (*)
Environmental: Degradation studies : biodegradated by white rot fungus (Proc.Annu.Meet.Am.Wood-Preserv.Assoc.1989) May be utilised by axenic cultures of microorganisms e.g. Pseudomonas pancimobilis EPA505, which may have novel degradative systems(Mueller,J.G. et al ppl.Environ.Microbiol.1990; Mueller, J.G. et al Environ.Sci.Technol.1991).
Physical: Not found.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 218-01-9: waste number U050.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 218-01-9 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313

This material contains Chrysene (CAS# 218-01-9, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 218-01-9 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 218-01-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Chrysene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: CAS# 218-01-9: 0.35 æg/day NSRL (oral)

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 45 May cause cancer.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou s waste.

S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 218-01-9: No information available.

Canada - DSL/NDSL

CAS# 218-01-9 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 218-01-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/30/1999
Revision #4 Date: 10/03/2005

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet

Fluoranthene, 98%

ACC# 80991

Section 1 - Chemical Product and Company Identification

MSDS Name: Fluoranthene, 98%
Catalog Numbers: AC119170000, AC119170250, AC119171000, AC119175000
Synonyms: 1,2-(1,8-Naphthalenediyl)benzene; 1,2-(1,8-Naphthylene)benzene; 1,2-Benzacenaphthene; Benzene, 1,2-(1,8-naphthylene)-; Benzo(j,k)fluorene; Benzo(jk)fluoranthene; Benzo(jk)fluorene
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
206-44-0	Fluoranthene	98	205-912-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow needles.
Caution! Harmful. Causes eye and skin irritation and possible burns. May be harmful if absorbed through the skin. May be harmful if swallowed. May cause heart and liver injury.
Target Organs: Heart, liver, lungs.

Potential Health Effects

Eye: Causes eye irritation and possible burns.
Skin: May be harmful if absorbed through the skin. Causes severe skin irritation and possible burns.
Ingestion: May be harmful if swallowed. May cause rapid heartbeat and cardiac arrythmias. May cause liver injury, pulmonary edema, and respiratory arrest. May cause gastrointestinal disturbances such as nausea.
Inhalation: May cause effects similar to those described for ingestion. May produce cardiac failure and pulmonary edema.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the

upper and lower eyelids. Get medical aid imme diately. Do NOT allow victim to rub eyes or keep eyes closed. Extensiv e irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Remove contaminated clothing and shoes.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood. Do not breathe dust.
Storage: Keep containers tightly closed. Store in a cool, dry area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Fluoranthene	none listed	none listed	none listed

OSHA Vacated PELs: Fluoranthene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves and clothing to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Needles
Appearance: yellow
Odor: None reported.
pH: Not available.
Vapor Pressure: 0.01 mm Hg @ 20 deg C
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 384 deg C @ 760.00mmHg
Freezing/Melting Point:107.00 - 110.00 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density:1.252 g/cm3
Molecular Formula:C16H10
Molecular Weight:202.25

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, strong oxidants.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, acrid smoke and fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 206-44-0: LL4025000
LD50/LC50:
CAS# 206-44-0:
Oral, rat: LD50 = 2 gm/kg;

Skin, rabbit: LD50 = 3180 mg/kg;
.

Carcinogenicity:
CAS# 206-44-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: IARC Group 3: Limited or insufficient evidence for carcinogenicity in both animals and humans.Experimental tumorigenic data has been reported.
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Mutation in microorganisms: Salmonella typhimurium = 5ug/plate.Mutation in mammalian somatic cells: Human Lymphocyte = 2 umol/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 3980 um/L; 96 H; (not specified) No data available.
Environmental: Remains in the upper few cm of soil, but can be transported to groundwater. Biodegrades from soil in a few years. Will not volatilize from soil or water. Rapidly absorbed to sediment and particulates and will readily bioconcentrate. Unadsorbed substance in water will degrade by photolysis in a days to weeks. Stable in sediment for decades or more. In the atmostphere, photodegrades with half life of 4 - 5 days, but may transport long distances without settling or raining out.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 206-44-0: waste number U120.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 206-44-0 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 206-44-0: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 206-44-0: immediate.

Section 313

This material contains Fluoranthene (CAS# 206-44-0, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 206-44-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 206-44-0 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 206-44-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 21/22 Harmful in contact with skin and if swallowed.

Safety Phrases:

S 22 Do not breathe dust.
S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 206-44-0: No information available.

Canada - DSL/NDSL

CAS# 206-44-0 is listed on Canada's NDSL List.

Canada - WHMIS

This product has a WHMIS classification of D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 206-44-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #5 Date: 10/03/2005

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MSDS Number: **L2347** * * * * * *Effective Date:* ***08/10/04*** * * * * * *Supercedes:* ***11/02/01***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

LEAD METAL

1. Product Identification

Synonyms: Granular lead, pigment metal; C.I. 77575
CAS No.: 7439-92-1
Molecular Weight: 207.19
Chemical Formula: Pb
Product Codes:
J.T. Baker: 2256, 2266
Mallinckrodt: 5668

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Lead	7439-92-1	95 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:

Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.

Ingestion:
POISON! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:
Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation, redness and pain.

Eye Contact:
Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.

Chronic Exposure:
Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted.

Aggravation of Pre-existing Conditions:
Persons with pre-existing kidney, nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Powder/dust is flammable when heated or exposed to flame.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Can produce toxic lead fumes at elevated temperatures and also react with oxidizing materials.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead

metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For lead, metal and inorganic dusts and fumes, as Pb:
-OSHA Permissible Exposure Limit (PEL): 0.05 mg/m3 (TWA)
For lead, elemental and inorganic compounds, as Pb:
-ACGIH Threshold Limit Value (TLV): 0.05 mg/m3 (TWA), A3 animal carcinogen
ACGIH Biological Exposure Indices (BEI): 30 ug/100ml, notation B (see actual Indices for more information).
For lead, inorganic:
-NIOSH Recommended Exposure Limit (REL): 0.1 mg/m3 (TWA)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face high efficiency particulate respirator (NIOSH type N100 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency particulate respirator (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.
Other Control Measures:
Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

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9. Physical and Chemical Properties

Appearance:
Small, white to blue-gray metallic shot or granules.
Odor:
Odorless.
Solubility:
Insoluble in water.
Density:
11.34
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1740C (3164F)
Melting Point:
327.5C (622F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
1.77 @ 1000C (1832F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Does not decompose but toxic lead or lead oxide fumes may form at elevated temperatures.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Ammonium nitrate, chlorine trifluoride, hydrogen peroxide, sodium azide, zirconium, disodium acetylide, sodium acetylide and oxidants.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Lead and other smelter emissions are human reproductive hazards. (Chemical Council on

Environmental Quality; Chemical Hazards to Human Reproduction, 1981).
Carcinogenicity:
EPA / IRIS classification: Group B2 - Probable human carcinogen, sufficient animal evidence.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Lead (7439-92-1)	No	No	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to leach into groundwater. This material may bioaccumulate to some extent.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Lead (7439-92-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

	--Canada--

Ingredient	Korea	DSL	NDSL	Phil.
Lead (7439-92-1)	Yes	Yes	No	Yes

\-------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Lead (7439-92-1)	No	No	Yes	No

\-------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Lead (7439-92-1)	10	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

WARNING:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: None allocated.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not

breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:
Laboratory Reagent.

Revision Information:
No Changes.

Disclaimer:
****

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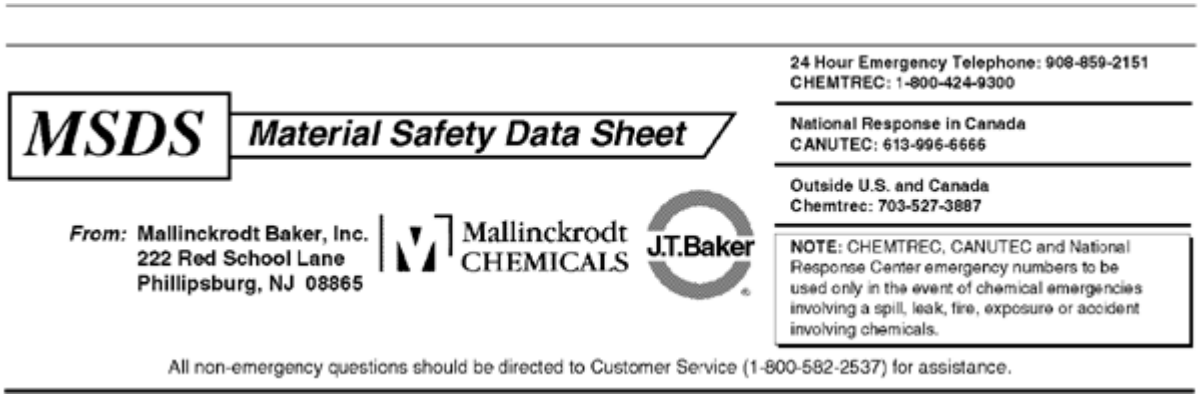
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **M1599** * * * * * *Effective Date:* ***12/19/05*** * * * * * *Supercedes:* ***08/10/04***



MERCURY

1. Product Identification

Synonyms: Quicksilver; hydrargyrum; Liquid Silver
CAS No.: 7439-97-6
Molecular Weight: 200.59
Chemical Formula: Hg
Product Codes:
J.T. Baker: 2564, 2567, 2569
Mallinckrodt: 1278, 1280, 1288

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Mercury	7439-97-6	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Mercury vapor is highly toxic via this route. Causes severe respiratory tract damage. Symptoms include sore throat, coughing, pain, tightness in chest, breathing difficulties, shortness of breath, headache, muscle weakness, anorexia, gastrointestinal disturbance, ringing in the ear, liver changes, fever, bronchitis and pneumonitis. Can be absorbed through inhalation with symptoms similar to ingestion.

Ingestion:
May cause burning of the mouth and pharynx, abdominal pain, vomiting, corrosive ulceration, bloody diarrhea. May be followed by a rapid and weak pulse, shallow breathing, paleness, exhaustion, tremors and collapse. Delayed death may occur from renal failure. Gastrointenstinal uptake of mercury is less than 5% but its ability to penetrate tissues presents some hazard. Initial symptoms may be thirst, possible abdominal discomfort.

Skin Contact:
Causes irritaton and burns to skin. Symptoms include redness and pain. May cause skin allergy and sensitization. Can be absorbed through the skin with symptoms to parallel ingestion.

Eye Contact:
Causes irritation and burns to eyes. Symptoms include redness, pain, blurred vision; may cause serious and permanent eye damage.

Chronic Exposure:
Chronic exposure through any route can produce central nervous system damage. May cause muscle tremors, personality and behavior changes, memory loss, metallic taste, loosening of the teeth, digestive disorders, skin rashes, brain damage and kidney damage. Can cause skin allergies and accumulate in the body. Repeated skin contact can cause the skin to turn gray in color. A suspected reproductive hazard; may damage the developing fetus and decrease fertility in males and females.

Aggravation of Pre-existing Conditions:
Persons with nervous disorders, or impaired kidney or respiratory function, or a history of allergies or a known sensitization to mercury may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Undergoes hazardous reactions in the presence of heat and sparks or ignition. Smoke may contain toxic mercury or mercuric oxide. Smoke may contain toxic mercury or mercuric oxide.

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6. Accidental Release Measures

Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapor.

Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate misting. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Do not flush to sewer. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker CINNASORB® and RESISORB® are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Do not use or store on porous work surfaces (wood, unsealed concrete, etc.). Follow strict hygiene practices. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Acceptable Ceiling Concentration:
mercury and mercury compounds: 0.1 mg/m3 (TWA), skin
- ACGIH Threshold Limit Value (TLV):
inorganic and metallic mercury, as Hg: 0.025 mg/m3 (TWA) skin, A4 Not classifiable as a human carcinogen.
- ACGIH Biological Exposure Indices:
total inorganic mercury in urine (preshift): 35 ug/g creatinine;
total inorganic mercury in blood (end of shift): 15 ug/l.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face respirator with a mercury vapor or chlorine gas cartridge may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with a mercury vapor or chlorine gas cartridge may be worn up to 50 times the exposure limit, or the maximum use concentraiton specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Silver-white, heavy, mobile, liquid metal.
Odor:
Odorless.
Solubility:
Insoluble in water.
Density:
13.55
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
356.7C (675F)
Melting Point:
-38.87C (-38F)
Vapor Density (Air=1):
7.0
Vapor Pressure (mm Hg):
0.0018 @ 25C (77F)
Evaporation Rate (BuAc=1):
4

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
At high temperatures, vaporizes to form extremely toxic fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Acetylenes, ammonia, ethylene oxide, chlorine dioxide, azides, metal oxides, methyl silane, lithium, rubidium, oxygen, strong oxidants, metal carbonyls.
Conditions to Avoid:
Heat, flames, ignition sources, metal surfaces and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
All forms of mercury can cross the placenta to the fetus, but most of what is known has

been learned from experimental animals. See Chronic Health Hazards.
Carcinogenicity:
EPA / IRIS classification: Group D1 - Not classifiable as a human carcinogen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Mercury (7439-97-6)	No	No	3

12. Ecological Information

Environmental Fate:
This material has an experimentally-determined bioconcentration factor (BCF) of greater than 100. This material is expected to significantly bioaccumulate.
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

International (Water, I.M.O.)

Proper Shipping Name: MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

International (Air, I.C.A.O.)

Proper Shipping Name: MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

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15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                    TSCA  EC   Japan  Australia
-------------------------------------------  ----  ---  -----  ---------
Mercury (7439-97-6)                           Yes  Yes   No       Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                      --Canada--
Ingredient                                    Korea  DSL   NDSL  Phil.
-------------------------------------------  -----  ---   ----  -----
Mercury (7439-97-6)                           Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Mercury (7439-97-6)                       No    No      Yes        No

--------\Federal, State & International Regulations - Part 2\----------------
                                                      -RCRA-    -TSCA-
Ingredient                                CERCLA      261.33     8(d)
----------------------------------------  ------      ------    ------
Mercury (7439-97-6)                       1           U151       No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Liquid)
```

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 2Z
Poison Schedule: S7
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
****

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****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet

Phenanthrene, 90%

ACC# 59921

Section 1 - Chemical Product and Company Identification

MSDS Name: Phenanthrene, 90%
Catalog Numbers: AC130100000, AC130100010, AC130102500
Synonyms:
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
85-01-8	Phenanthrene	90.0	201-581-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: brown solid.
Caution! Powdered material may form explosive dust-air mixtures. May cause allergic skin reaction. May cause eye and skin irritation. May cause respiratory tract irritation. Cancer suspect agent.
Target Organs: None.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation. May cause photosensitive skin reactions in certain individuals.
Ingestion: May cause irritation of the digestive tract.
Inhalation: Inhalation of dust may cause respiratory tract irritation.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dusts at sufficient concentrations can form explosive mixtures with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use water spray or dry chemical.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Phenanthrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Phenanthrene: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: brown
Odor: none reported
pH: Not available.
Vapor Pressure: 1 mm Hg @116c
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 340 deg C
Freezing/Melting Point:101 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density:1.0630g/cm3
Molecular Formula:C14H10
Molecular Weight:178.23

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, dust generation, strong oxidants.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 85-01-8: SF7175000
LD50/LC50:
CAS# 85-01-8:
Oral, mouse: LD50 = 700 mg/kg;
Oral, rat: LD50 = 1.8 gm/kg;
.

Carcinogenicity:
CAS# 85-01-8:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').
- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 85-01-8 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 85-01-8: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 85-01-8: immediate.

Section 313

This material contains Phenanthrene (CAS# 85-01-8, 90.0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 85-01-8 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 85-01-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 45 May cause cancer.

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 85-01-8: No information available.

Canada - DSL/NDSL

CAS# 85-01-8 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

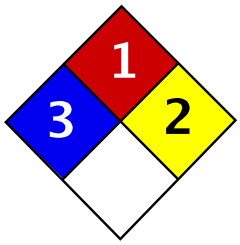
Canadian Ingredient Disclosure List

CAS# 85-01-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/14/1998
Revision #3 Date: 10/03/2005

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.



Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

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
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, the nervous system, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage.

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. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

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. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. 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 away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust 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:
TWA: 0.01 from ACGIH (TLV) [United States] [1995]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation.
Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

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 as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic
Pennsylvania RTK: Arsenic
Massachusetts RTK: Arsenic
TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-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.

Created: 10/09/2005 04:16 PM

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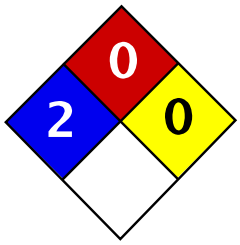

Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Nickel metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel metal

Catalog Codes: SLN2296, SLN1342, SLN1954

CAS#: 7440-02-0

RTECS: QR5950000

TSCA: TSCA 8(b) inventory: Nickel metal

CI#: Not applicable.

Synonym: Nickel Metal shot; Nickel metal foil.

Chemical Name: Nickel

Chemical Formula: Ni

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
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1-800-424-9300

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For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

Toxicological Data on Ingredients: Nickel metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer).
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to skin.
The substance may be toxic to kidneys, lungs, liver, upper respiratory tract.
Repeated or prolonged exposure to the substance can produce target organs damage.

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. Get medical attention if irritation occurs.

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. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

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: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating a dust explosion.
Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode.
Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion.
Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. 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.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust 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:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation Respirable.
TWA: 0.5 (mg/m3) [United Kingdom (UK)]
TWA: 1 (mg/m3) from OSHA (PEL) [United States] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid. Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 58.71 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 2730°C (4946°F)

Melting Point: 1455°C (2651°F)

Critical Temperature: Not available.

Specific Gravity: Density: 8.908 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water.
Insoluble in Ammonia.
Soluble in dilute Nitric Acid.
Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
Causes damage to the following organs: skin.
May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:

Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose/Conc:
LDL [Rat] - Route: Oral; Dose: 5000 mg/kg
LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Nickel dust and fume can irritate skin.
Eyes: Nickel dust and fume can irritate eyes.
Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis.
Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased cornary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation).
Chronic Potential Health Effects:
Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis.
Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count).
Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy. Chronic ingestion of NIckel may also affect respiration and cause pneumoconiosis or fibrosis.
Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

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 as toxic as the original product.

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: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal
Connecticut hazardous material survey.: Nickel metal
Illinois toxic substances disclosure to employee act: Nickel metal
Illinois chemical safety act: Nickel metal
New York release reporting list: Nickel metal
Rhode Island RTK hazardous substances: Nickel metal
Pennsylvania RTK: Nickel metal
Michigan critical material: Nickel metal
Massachusetts RTK: Nickel metal
Massachusetts spill list: Nickel metal
New Jersey: Nickel metal
New Jersey spill list: Nickel metal
Louisiana spill reporting: Nickel metal
California Director's List of Hazardous Substances: Nickel metal
TSCA 8(b) inventory: Nickel metal

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).

DSCL (EEC):
R40- Possible risks of irreversible effects.
R43- May cause sensitization by skin contact.
S22- Do not breathe dust.
S36- Wear suitable protective clothing.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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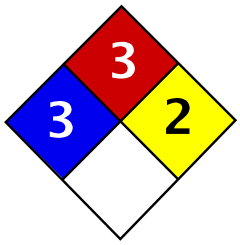

Health	3
Fire	3
Reactivity	2
Personal Protection	J

Material Safety Data Sheet
Calcium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Calcium

Catalog Codes: SLC2782

CAS#: 7440-70-2

RTECS: EV8040000

TSCA: TSCA 8(b) inventory: Calcium

CI#: Not available.

Synonym:

Chemical Formula: Ca

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

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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
Calcium	7440-70-2	100

Toxicological Data on Ingredients: Calcium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to lungs, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid. Flammable solid that, in contact with water, emits flammable gases.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as acids, moisture.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust 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: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 40.08 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 1484°C (2703.2°F)

Melting Point: 839°C (1542.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.54 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Not available.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with acids.
Reactive with moisture.
The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

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.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Calcium : UN1401 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Calcium
Massachusetts RTK: Calcium
TSCA 8(b) inventory: Calcium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material.
CLASS E: Corrosive solid.

DSCL (EEC): R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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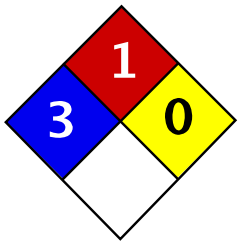

Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

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Houston, Texas 77396

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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
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, liver.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an 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: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. 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 away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust 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:
TWA: 0.01 (ppm)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 890 mg/kg [Mouse].
Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.
The substance is toxic to kidneys, lungs, liver.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

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 as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium
Pennsylvania RTK: Cadmium
Massachusetts RTK: Cadmium
TSCA 8(b) inventory: Cadmium
SARA 313 toxic chemical notification and release reporting: Cadmium
CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R26- Very toxic by inhalation.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-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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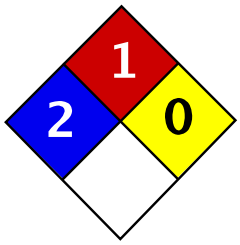

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper

Catalog Codes: SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

CAS#: 7440-50-8

RTECS: GL5325000

TSCA: TSCA 8(b) inventory: Copper

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Cu

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
Copper	7440-50-8	100

Toxicological Data on Ingredients: Copper LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to lungs, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. 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 away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust 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:
TWA: 1 (mg/m3) from ACGIH [1990]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 63.54 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 2595°C (4703°F)

Melting Point: 1083°C (1981.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.94 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion.
Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans: Not available.

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 as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Copper
Massachusetts RTK: Copper
TSCA 8(b) inventory: Copper
CERCLA: Hazardous substances.: Copper

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator

when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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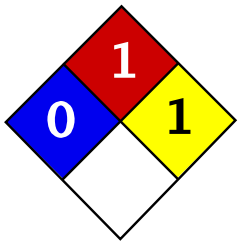

Material Safety Data Sheet
Magnesium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium

Catalog Codes: SLM4408, SLM2263, SLM3637

CAS#: 7439-95-4

RTECS: OM2100000

TSCA: TSCA 8(b) inventory: Magnesium

CI#: Not applicable.

Synonym: Magnesium ribbons, turnings or sticks

Chemical Name: Magnesium

Chemical Formula: Mg

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
Magnesium	7439-95-4	100

Toxicological Data on Ingredients: Magnesium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

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. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

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. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat.
Flammable in presence of acids, of moisture.
Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Explosive in presence of acids, of moisture.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air.
Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas with is highly flammable and eplosive

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid.
Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Dangerous when wet.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust 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: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 24.31 g/mole

Color: Silver-white

pH (1% soln/water): Not applicable.

Boiling Point: 1100°C (2012°F)

Melting Point: 651°C (1203.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.74 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Very slightly soluble in hot water.
Insoluble in cold water.
Insoluble in chromium trioxides, and mineral acids, alkalies.
Slightly soluble with decomposition in hot water.
Soluble in concentrated hydrogen fluoride, and ammonium salts.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, incompatible materials, water or moisture, moist air.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent chemical reaction with oxidizing agents.
Reacts with water to create hydrogen gas and heat. Must be kept dry.
Reacts with acids to form hydrogen gas which is highly flammable and explosive.
Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphodiiodide; bromobenzyl trifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide; zinc oxide.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritation by mechanical action. May get mechanical injury or embedding of chips/particles in skin. The particles that are embedded in the wounds may retard healing.
Eyes: May cause eye irritation by mechanical action. Mechanical injury may occur. Particles or chips may embed in eye and retard healing.
Inhalation: Low hazard for ususal industrial handling. It may cause respiratory tract irritation. However, it is unlikely due to physical form. When Magnesium metal is heated during welding or smelting process, Metal Fume Fever may result from inhalation of magnesium fumes. Metal Fume Fever is a flu-like condition consisting of fever, chills, sweating, aches, pains, cough, weakness, headache, nausea, vomiting, and breathing difficulty. Other symptoms may include metallic taste, increased white blood cell count. There is no permanent ill-effect.
Ingestion: Low hazard for usual industrial handling. There are no known reports of serious industrial poisonings with Magnesium. Ingeston of large amounts of chips, turnings or ribbons may cause gastrointestinal tract irritation with nausea, vomiting, and diarrhea. Acute ingestion may also result in Hypermagnesia. Hypermagnesia may cause hypotension, bradycardia, CNS depression, respiratory depression, and impairment of neuromuscular transmission (hyporeflexia, paralysis).

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 product itself and its products of degradation are not toxic.

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 4.1: Flammable solid.

Identification: : Magnesium UNNA: 1869 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Magnesium
Rhode Island RTK hazardous substances: Magnesium
Pennsylvania RTK: Magnesium

Massachusetts RTK: Magnesium
Massachusetts spill list: Magnesium
New Jersey: Magnesium
TSCA 8(b) inventory: Magnesium

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 B-4: Flammable solid.
CLASS B-6: Reactive and very flammable material.

DSCL (EEC):
R11- Highly flammable.
R15- Contact with water liberates extremely flammable gases.
S7/8- Keep container tightly closed and dry.
S43- In case of fire, use dry chemical. Never use water.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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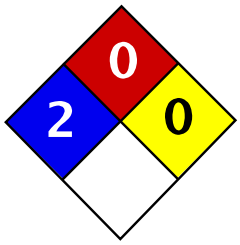

Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Nickel metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel metal

Catalog Codes: SLN2296, SLN1342, SLN1954

CAS#: 7440-02-0

RTECS: QR5950000

TSCA: TSCA 8(b) inventory: Nickel metal

CI#: Not applicable.

Synonym: Nickel Metal shot; Nickel metal foil.

Chemical Name: Nickel

Chemical Formula: Ni

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
Nickel metal	7440-02-0	100

Toxicological Data on Ingredients: Nickel metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer).
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to skin.
The substance may be toxic to kidneys, lungs, liver, upper respiratory tract.
Repeated or prolonged exposure to the substance can produce target organs damage.

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. Get medical attention if irritation occurs.

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. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

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: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating a dust explosion.
Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode.
Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion.
Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. 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.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust 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:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation Respirable.
TWA: 0.5 (mg/m3) [United Kingdom (UK)]
TWA: 1 (mg/m3) from OSHA (PEL) [United States] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid. Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 58.71 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 2730°C (4946°F)

Melting Point: 1455°C (2651°F)

Critical Temperature: Not available.

Specific Gravity: Density: 8.908 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water.
Insoluble in Ammonia.
Soluble in dilute Nitric Acid.
Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
Causes damage to the following organs: skin.
May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:

Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose/Conc:
LDL [Rat] - Route: Oral; Dose: 5000 mg/kg
LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Nickel dust and fume can irritate skin.
Eyes: Nickel dust and fume can irritate eyes.
Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis.
Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased cornary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation).
Chronic Potential Health Effects:
Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis.
Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count).
Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy. Chronic ingestion of NIckel may also affect respiration and cause pneumoconiosis or fibrosis.
Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

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 as toxic as the original product.

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: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal
Connecticut hazardous material survey.: Nickel metal
Illinois toxic substances disclosure to employee act: Nickel metal
Illinois chemical safety act: Nickel metal
New York release reporting list: Nickel metal
Rhode Island RTK hazardous substances: Nickel metal
Pennsylvania RTK: Nickel metal
Michigan critical material: Nickel metal
Massachusetts RTK: Nickel metal
Massachusetts spill list: Nickel metal
New Jersey: Nickel metal
New Jersey spill list: Nickel metal
Louisiana spill reporting: Nickel metal
California Director's List of Hazardous Substances: Nickel metal
TSCA 8(b) inventory: Nickel metal

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).

DSCL (EEC):
R40- Possible risks of irreversible effects.
R43- May cause sensitization by skin contact.
S22- Do not breathe dust.
S36- Wear suitable protective clothing.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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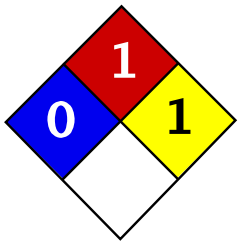

Health	1
Fire	1
Reactivity	1
Personal Protection	E

Material Safety Data Sheet
Zinc Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc Metal

Catalog Codes: SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

CAS#: 7440-66-6

RTECS: ZG8600000

TSCA: TSCA 8(b) inventory: Zinc Metal

CI#: Not applicable.

Synonym: Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

Chemical Name: Zinc Metal

Chemical Formula: Zn

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
Zinc Metal	7440-66-6	100

Toxicological Data on Ingredients: Zinc Metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

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. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture.
Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Zinc + NaOH causes ignition.
Oxidation of zinc by potassium proceeds with incandescence.
Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper.
Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined.
When hydrazine mononitrate is heated in contact with zinc, a flamming decomposition occurs at temperatures a little above its melting point.
Contact with acids and alkali hydroxides (sodium hydroxide, postasium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas.
Zinc foil ignites if traces of moisture are present.
It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or

moist air.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust 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: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid. Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 65.39 g/mole

Color: Bluish-grey

pH (1% soln/water): Not applicable.

Boiling Point: 907°C (1664.6°F)

Melting Point: 419°C (786.2°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, moisture

Incompatibility with various substances:
Reactive with oxidizing agents, acids, alkalis.
Slightly reactive to reactive with moisture.
The product may react violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with acids, halogenated hydrocarbons, NH_4NO_3, barium oxide, $Ba(NO_3)_2$, Cadmium, CS_2, chlorates, Cl_2, CrO_3, F_2, Hydroxylamine, $Pb(N_3)_2$, $MnCl_2$, HNO_3, performic acid, $KClO_3$, KNO_3, N_2O_2, Selenium, $NaClO_3$, Na_2O_2, Sulfur, Te, water, $(NH_4)_2S$, As_2O_3, CS_2, $CaCl_2$, chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide, HCl, H_2SO_4, (Mg +$Ba(NO_3)_2$ +BaO_2), (ethyl acetoacetate +tribromoneopentyl alcohol.
Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen.
Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide.
May react with water.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss.
Eyes: May cause eye irritation.
Ingestion: May be harmul if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizzness, irritability, muscular stiffness, and pain. May also affect blood.
Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis.
The toxicological properties of this substance have not been fully investisgated.

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: Not available.

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: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

New York release reporting list: Zinc Metal
Rhode Island RTK hazardous substances: Zinc Metal
Pennsylvania RTK: Zinc Metal
Florida: Zinc Metal
Michigan critical material: Zinc Metal
Massachusetts RTK: Zinc Metal
New Jersey: Zinc Metal
California Director's List of Hazardous Substances: Zinc Metal
TSCA 8(b) inventory: Zinc Metal
TSCA 12(b) one time export: Zinc Metal
SARA 313 toxic chemical notification and release reporting: Zinc Metal
CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not Available

DSCL (EEC):
R15- Contact with water liberates
extremely flammable gases.
R17- Spontaneously flammable in air.
S7/8- Keep container tightly closed and dry.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 1

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an
approved/certified respirator or
equivalent.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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ATSDR Department of Health and Human Services Agency for Toxic Substances & Disease Registry

ToxFAQs™: Chemical Agent Briefing Sheets (CABS)

Lead

January 2006

PDF Version

- What is lead?
- What are the forms of lead?
- What are the common uses of lead?
- What are the routes of exposure for lead?
- Who are the populations most at risk and how are they usually exposed?
- What are the possible toxic effects of lead?
- How can I reduce the risk of exposure to lead?
- What are the safety guidelines for lead exposure?
- What are the most important or common mediating factors?
- Is there a test to see if my child or I have been exposed to lead?
- Future Research Needs
- For more information

What is lead?

Lead is a heavy, bluish-gray metal that has a low melting point. It occurs naturally in the Earth' s crust, but it is not a particularly abundant element. It is rarely found naturally as a metal, but rather in its divalent (2+) oxidative state in ore deposits widely distributed throughout the world. The most im portant lead containing ores are galena (PbS), anglesite ($PbSO_4$), and cerussite ($PbCO_3$). Natural lead is a mixture of four stable isotopes: ^{208}Pb (51%–53%), ^{206}Pb (23.5%–27%), ^{207}Pb (20.5%–23%), and ^{204}Pb (1.35%–1.5%).

What are the forms of lead?

- Metallic lead
- Inorganic lead and lead compounds (or lead salts)
- Organic lead (containing carbon)

What are the common uses of lead?

The largest use for lead is in storage batteries in cars and other vehicles. Lead may be used as a pure metal, alloyed with other metals, or as chemical compounds.

Lead used by industry comes from mined ores ("primary") or from recycled scrap metal or batteries ("secondary"). However, most lead today is obtained from recovery of recycled scrap, mostly lead-a cid batteries.

Human activities, such as lead mining and smelting operations and manufacturing and use of lead products (*e.g.*, leaded gasoline, lead-based paint), have resulted in the contamination of many industrial and residential areas with lead.

Form	Uses
Metallic lead	Certain uses of lead, such as leaded gasoline, lead-based paints for domestic use, lead-based solder in food cans and water pipes, lead sinkers, and ammunition, have been reduced or banned to minimize lead's harmful effects on people and animals.
Lead and lead compounds (or lead salts), such as • **lead acetate** • **lead chloride** • **lead nitrate** • **lead oxide** • **lead phosphate** • **lead acetate**	• **Cosmetics and hair dye** - Some hair dyes and some non-Western cosmetics, such as kohl and surma, contain lead. • **Fishing equipment** - Most fishing weights and sinkers are made from lead. • **Folk remedies** - Many non-Western folk remedies used to treat diarrhea or other ailments may contain substantial amounts of lead. Examples of these include alarcon, ghasard, alkohl, greta, azarcon,

• **lead sulfate** • **lead sulfide**	liga, bali goli, pay-loo-ah, coral, and rueda. • **Glazing** - Applied to some ceramicware can contain lead. • **Lead based paint** - Although the sale of residential lead-based paint was banned in the United States in 1978, it remains a major source of lead exposure for young children residing in older houses. • **Lead batteries** - Production of lead-acid batteries is the major use of lead. • **Lead-based solder** - Has been banned for use in water distribution systems, but many buildings and homes contain lead pipes or lead-based solder. Lead-based solder also is used for electrical circuitry applications. • **Lead-shot** and **ammunition** - It is the second highest production use of lead. • Other uses of lead include the production of lead alloys, soldering materials, shielding for x-ray machines, and manufacturing of corrosion- and acid-resistant materials used in the building industry.
Organic • **tetraethyl lead** • **tetramethyl lead**	The use of lead in gasoline was phased out in the 1980s, and has been banned since January 1, 1996. The use of lead in gasoline has contributed to its dispersion throughout the environment. During the combustion of gasoline containing these alkyllead compounds, significant amounts of inorganic lead can be released to the surrounding areas. **Current Uses** • Gasoline for off-road vehicles, farm equipment, and airplanes **Past Uses** • Gasoline additives (to increase octane rating)

What are the routes of exposure for lead?

People are most likely to be exposed to lead by consuming contaminated food and drinking water. Exposure can also occur by inadvertently ingesting contaminated soil, dust, or lead-based paint.

Form	Routes of Exposure
Metallic lead **Lead and lead compounds (or lead salts), such as** • **lead acetate** • **lead chloride** • **lead nitrate** • **lead oxide** • **lead phosphate** • **lead subacetate** • **lead sulfate** • **lead sulfide**	• Ingestion is the primary source of exposure to the general population. • Lead paint is a major source of environmental exposure for children who ingest flaking paint, paint chips, and weathered powdered paint (mostly from deteriorated housing units in urban areas). Lead paint can also contribute to soil/dust lead which can be inadvertently ingested via hand-to-mouth activity of young children. • Lead can leach into drinking water from lead-based solder used in water pipes. • Lead can leach into foods or liquids stored in ceramic containers made with lead glazing. • Engaging in hobbies such as casting ammunition, making fishing weights, and stained glass can result in exposure to lead. • Exposure by inhalation can result during activities such as soldering with lead solder or sanding or sandblasting lead-based paint.
Organic • **tetraethyl lead** • **tetramethyl lead**	• Inhalation • Dermal studies in animals have shown that organic lead is well absorbed through the skin

Who are the populations most at risk and how are they usually exposed?

People living near hazardous waste sites, lead smelters or refineries, battery recycling or crushi ng centers, or other industrial lead sources may be exposed to lead and chemicals that contain lead. Workers in occupations that have sources of lead exposure (*e.g.*, plumbers, miners, mechanics, and lead smelter or refinery workers).

Certain hobbies, folk remedies, home activities, and car repairs (*e.g.*, radiator repair) can contribute to lead exposure. Smoking cigarettes or breathing second-hand smoke increases exposure because tobacco smoke contains small amounts of lead.

Pregnant women, the developing fetuses, and young children are particularly vulnerable to the effe cts of lead. Young children are more likely to play in dirt and to place their hands and other objects in their

mouths, thereby increasing the opportunity for exposure via ingestion of lead-contaminated soil an d dust.

What are the possible toxic effects of lead?

The most sensitive targets for lead toxicity are the developing nervous system, the hematological and cardiovascular systems, and the kidney. However, because of lead's many modes of action in biologi cal systems, lead could potentially affect any system or organs in the body. The effects are the same whether it is breathed or swallowed.

Blood Lead Concentrations Corresponding to Adverse Health Effects

Life Stage	Effect	Blood lead (µg/dL)
Children	Depressed ALAD* activity	<5
	Neurodevelopmental effects	<10
	Sexual maturation	<10
	Depressed vitamin D	>15
	Elevated EP**	>15
	Depressed NCV***	>30
	Depressed hemoglobin	>40
	Colic	>60
Adults	Depressed GFR****	<10
	Elevated blood pressure	<10
	Elevated EP (females)	>20
	Enzymuria/proteinuria	>30
	Peripheral neuropathy	>40
	Neurobehavioral effects	>40
	Altered thyroid hormone	>40
	Reduced fertility	>40
	Depressed hemoglobin	>50
Elderly adults	Depressed ALAD*	<5
	Neurobehavioral effects	>4

*aminolevulinic acid dehydratase (ALAD)

**erythrocyte porphyrin (EP)

***nerve conduction velocity (NCV)

****glomerular filtration rate (GFR)

Source: ATSDR Toxicological Profile for Lead (Draft for Public Comment), 2005.

How can I reduce the risk of exposure to lead?

- Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint (homes built before 1978).
- If you have a water lead problem, the U.S. Environmental Protection Agency (EPA) recommends that you flush your cold water pipes if they have not been used in over 6 hours by running water until it is cold (5 seconds to 2 minutes) before drinking or cooking with it.
- Avoid some types of paints and pigments that contain lead and are used as make-up or hair coloring; keep these kinds of products away from children.
- Hire a professional contractor, who is required to follow certain health safety requirements for remediation or renovation involving lead-based paint, (www.epa.gov/lead/pubs/leadinfo.htm#remodeling).
- Wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

What are the safety guidelines for lead exposure?

Air

- National Institute for Occupational Safety and Health (NIOSH)

  Recommended exposure limit (REL) time-weighted average (TWA) - 0.05 mg/m^3
  Immediately dangerous to life or health (IDLH) - 100 mg/m^3

- Occupational Safety and Health Administration (OSHA)

  Air - workplace 50 $\mu g/m^3$
  Action level - 40 µg/100 g of whole blood

- The American Conference of Governmental Industrial Hygienists (ACGIH)

Threshold limit values (TLV)/(TWA) - 0.05 mg/m^3
TLV/TWA guideline for lead arsenate - 150 µg/m^3
TLV/TWA guideline for other forms of lead - 50 µg lead/m^3

- U.S. Environmental Protection Agency (EPA)

  National Primary and Secondary Ambient Air Quality Standards - 1.5 µg/m^3

- World Health Organization (WHO)

  Air quality guidelines -- 0.5 µg/m^3

Water

- EPA

  Maximum contaminant level (MCL) - action level 0.015 mg/L
  Action level for public supplies - 15 µg/L

- WHO

  Drinking Water Quality Guidelines - 0.01 mg/L

Blood

- Centers for Disease Control and Prevention (CDC)

  Level of concern for children - 10 µg/dL

- OSHA

  Cause for written notification and medical exam - 40 µg/dL
  Cause for medical removal from exposure - 50 µg/dL

- ACGIH

  Advisory; biological exposure index - 30 µg/dL

Food

- Food and Drug Administration (FDA)

  Bottled drinking water - 0.005 mg/L

Other

- ACGIH

  Biological exposure indices (lead in blood) - 30 µg/100 mL

- Consumer Product Safety Commission

  Paint - 600 ppm

- FDA

  Ceramicware (µg/mL leaching solution) - 0.5-3.0 µg/mL

µg/m^3: micrograms per cubic meter
µg/dL: micrograms per deciliter
µg/L: micrograms per liter
g: gram
mg/L: milligrams per liter
mL: milliliter
ppm: parts per million

What are the most important or common mediating factors?

Factors that determine the severity of the health effects from lead exposure include

- Dose
- Age of the person exposed
  - the developing nervous system is the most sensitive system to the effects of lead
  - the efficiency of lead absorption from the gastrointestinal tract is greater in children than in adults
- Life stages of women (childbirth, lactating, menopause)
- Occupational exposures
- Duration of exposure
- Health and lifestyle of the person exposed
- Nutritional status of the person exposed
  - a diet adequate in calcium and iron may decrease lead absorption

The toxic effects of lead exposure may be worse in individuals with inherited genetic diseases or gene polymorphisms such as thalassemia, individuals with glucose-6-phosphate dehydrogenase (G6PD) deficiency, and carriers of certain gene polymorphic forms (*e.g.*, ALAD and vitamin D receptor). Research continues about this topic.

Is there a test to see if my child or I have been exposed to lead?

Blood	• The screening test of choice is blood lead levels. • Blood tests are commonly used to screen children for lead poisoning. • Analysis of lead in whole blood is the most common and accurate method of assessing lead exposure. • Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL).
Bone and Teeth	• X-ray fluorescence techniques have been used to determine lead concentration in bones and teeth. It is not widely available and is used mostly in research. • Lead partitions to bone over a lifetime of exposure; therefore, bone lead measurements may be a better indicator of cumulative exposure than blood lead.
Urine	• Measurements of urinary lead levels have been used to assess lead exposure. • The measurement of lead excreted in urine following chelation with calcium disodium EDTA (EDTA provocation) has been used to detect elevated body burden of lead in adults and children.
Hair and Nails	• These are not reliable for testing due to errors external contamination. They are relatively poor predictors of blood lead, particularly at low concentrations.

Future Research Needs

To close current gaps in the scientific database on the health effects of lead, a long–term resear ch program is needed that might include the following:

- Further short-term studies or studies in vitro designed to clarify mechanisms of action for the various toxicities might be useful.
- Studies identifying exposures during different developmental periods can help identify critical periods of vulnerability for immunocompetence, development of sex organs, or neurobehavioral parameters.
- Chronic-duration exposure studies in animals would expand information on the toxicity of lead. Special studies that examine biochemical and morphological effects of lead may provide new information on mechanisms of action of lead, particularly for the effects of greatest concern such as neurobehavioral changes in children.
- Development of new and more sensitive tests of specific neuropsychological functions.
- Further investigation of links between lead and amyotrophic lateral sclerosis, essential tremor, schizophrenia, and Parkinson's disease.
- Epidemiological studies designed in a manner that permits more rigorous assessments of effect modification.
- Studies about the long-term consequences of lead-related neurobehavioral deficits detected in infants and children and the manifestation of chronic neurobehavioral problems in adolescence and adulthood.
- Further characterization of bone lead concentration as a biomarker of exposure for various effect end points (*e.g.*, blood pressure and renal effects).
- Studies of the potential prevalence of elevated bone lead stores in women of reproductive age and the associated risk that this poses to fetal development by mobilization of maternal bone stores during pregnancy.
- Further clarification of the role of some genetic polymorphisms.
- Evaluation of cohorts from prospective studies into adulthood for potential late-appearing effects including cancer.

For more information

- Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile for Lead

  http://www.atsdr.cdc.gov/toxprofiles/tp13.html

- ATSDR ToxFAQs™ for Lead

  http://www.atsdr.cdc.gov/tfacts13.html

- ATSDR Case Studies in Environmental Medicine Lead Toxicity

  http://www.atsdr.cdc.gov/csem/lead/

- ATSDR Interaction Profile for Chemical Mixtures for Arsenic, Cadmium, Chromium, and Lead

  http://www.atsdr.cdc.gov/interactionprofiles/ip04.html

- ATSDR Interaction Profile for Chemical Mixtures for Lead, Manganese, Zinc, and Copper

  http://www.atsdr.cdc.gov/interactionprofiles/ip06.html

- ATSDR Interaction Profile for Chemical Mixtures for Chlorpyrifos, Lead, Mercury, and Methylmercury

  http://www.atsdr.cdc.gov/interactionprofiles/ip11.html

- Centers for Disease Control and Prevention Lead Web Page

  http://www.cdc.gov/lead/

- U.S. Environmental Protection Agency Lead Web Page

  http://www.epa.gov/lead/

- U.S. Department of Labor, Occupational Safety & Health Administration

  http://www.osha.gov/SLTC/lead/

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333
Phone: 1-800-CDC-INFO (800-232-4636)
TTY 888-232-6348

FAX: (770)-488-4178
Email: CDCINFO@cdc.gov

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Mercury

Mercury is a naturally occurring metal found in air, water, and soil. It exists in several forms, including elemental (or metallic) mercury, inorganic mercury compounds, and organic mercury compounds:

- **Elemental mercury** is liquid at room temperature and is used in thermometers, fluorescent light bulbs, some electrical switches, and some industrial processes.
- **Inorganic mercury** compounds are formed when mercury combines with other elements to form salts, which are usually powders or crystals. Inorganic mercury compounds are found naturally in the environment. Some forms of inorganic mercury have been used in antiseptic creams, ointments, and preservatives.
- **Organic mercury** compounds are formed when mercury combines with carbon. Microscopic organisms can produce organic mercury compounds (methylmercury) in contaminated water and soil, which can accumulate in the food chain. Other special types of organomercurials have been used as medical preservatives and medicines.

How People Are Exposed to Mercury

- Eating fish or shellfish that is contaminated with methylmercury, which is the main source of general human exposures to mercury;
- Breathing air contaminated with elemental mercury vapors (e.g., in workplaces such as dental offices and industries that use mercury or in locations where a mercury spill or release has occurred);
- Having dental fillings that contain mercury; and
- Practicing cultural or religious rituals that use mercury.

How Mercury Affects People's Health

- Short-term exposure to extremely high levels of elemental mercury vapors can result in lung damage, nausea, diarrhea, increases in blood pressure or heart rate, skin rashes, eye irritation, and injury to the nervous system.
- Prolonged exposure to lower levels of elemental mercury can permanently damage the brain and kidneys.
- The developing brain of a fetus can be injured if the mother is exposed to methylmercury.

Levels of Mercury in U.S. Population

Scientists tested levels of mercury in the blood of 16,780 participants who took part in CDC's national study known as the National Health and Nutrition Examination Survey (NHANES). These findings are based on total blood mercury levels in the U.S. general

population for persons aged 1 year and older who participated in NHANES during 2003-2006, as well as trends in the total mercury of children aged 1–5 and females aged 16–49 during 1999–2006.

- In the total population during 2003–2006, the total blood mercury levels for non–Hispanic blacks and non–Hispanic whites were higher than those for Mexican Americans.
- Across the age groups in the total population during 2003-2006, total blood mercury levels increased with age, peaked at the fifth or sixth decade, depending on race/ethnicity, and then declined.
- In the most recent survey period of 2005–2006, the 95th percentile levels for total blood mercury in children aged 1-5 years and females aged 16-49 years were 1.43 µg/L and 4.48 µg/L, respectively. The 95th percentile means that 95 percent of the U.S. population's exposure is below this estimated level. Conversely, only 5 percent of the population will have values at this level or higher.
- Over the four survey periods from 1999-2006, blood mercury levels increased slightly for non–Hispanic white children and decreased slightly for non–Hispanic black and Mexican American children. Female children had slightly higher blood mercury levels than male children.

For More Information

- Agency for Toxic Substances and Disease Registry
  Detailed information about mercury and public health is available at
  http://www.atsdr.cdc.gov/alerts/970626.html and
  http://www.atsdr.cdc.gov/cabs/mercury/index.html
- CDC Emergency Preparedness and Response
  Case definitions of mercury, toxicology FAQs, and toxicological profile at
  http://emergency.cdc.gov/agent/mercury/

May 2009

The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.

Department of Health and Human Services
Agency for Toxic Substances & Disease Registry

ATSDR Home › ToxFAQs™ Arsenic

ToxFAQs™

ToxFAQs™
for
Arsenic
(*Arsénico*)
August 2007

PDF Version, 92 KB

CAS#: 7440-38-2

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

- Highlights
- What is arsenic?
- What happens to arsenic when it enters the environment?
- How might I be exposed to arsenic?
- How can arsenic affect my health?
- How likely is arsenic to cause cancer?
- How does arsenic affect children?
- How can families reduce their risk for exposure to arsenic?
- Is there a medical test to show whether I've been exposed to arsenic?
- Has the federal government made recommendations to protect human health?
- References
- Contact Information

Highlights

Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause naus ea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of “pins an d needles” in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of th e skin and the appearance of small “corns” or “warts” on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies i n animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cance r and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for R esearch on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How does arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ score s. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant fem ales, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal ti ssues. Arsenic is found at low levels in breast milk.

How can families reduce their risk for exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protecti ve clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner source s of water and limit contact with soil.
- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on y our clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to show whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urin e test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of ars enic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environ ment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic *(Update)*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE, Mailstop F-62
Atlanta, GA 30333
Phone: 1-800-CDC-INFO • 888-232-6348 (TTY)
FAX: 770-488-4178
Email: cdcinfo@cdc.gov

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state heal th or environmental quality department if you have any more questions or concerns.

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U.S. Environmental Protection Agency

Pesticides: Topical & Chemical Fact Sheets

Assessing Health Risks from Pesticides

January 1999
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The Federal Government, in cooperation with the States, carefully regulates pesticides to ensure that they do not pose unreasonable risks to human health or the environment. As part of that effort, the Environmental Protection Agency (EPA) requires extensive test data from pesticide producers that demonstrate pesticide products can be used without posing harm to human health and the environment. EPA scientists and analysts carefully review these data to determine whether to register (license) a pesticide product or a use and whether specific restrictions are necessary. This fact sheet is a brief overview of EPA's process for assessing potential risks to human health when evaluating pesticide products.

Background

There are more than 865 active ingredients registered as pesticides, which are formulated into thousands of pesticide products that are available in the marketplace. About 350 pesticides are used on the foods we eat, and to protect our homes and pets.

EPA plays a critical role in evaluating these chemicals prior to registration, and in reevaluating older pesticides already on the market, to ensure that they can be used with a reasonable certainty of no harm. The process EPA uses for evaluating the health impacts of a pesticide is called risk assessment.

EPA uses the National Research Council's four-step process for human health risk assessment:

Step One: Hazard Identification
Step Two: Dose-Response Assessment
Step Three: Exposure Assessment
Step Four: Risk Characterization

Step One: Hazard Identification (Toxicology)

The first step in the risk assessment process is to identify potential health effects that may occur from different types of pesticide exposure. EPA considers the full spectrum of a pesticide's potential health effects.

Generally, for human health risk assessments, many toxicity studies are conducted on animals by pesticide companies in independent laboratories and evaluated for acceptability by EPA scientists. EPA evaluates pesticides for a wide range of adverse effects, from eye and skin irritation to cancer and birth defects in laboratory animals. EPA may also consult the public literature or other sources of supporting information on any aspect of the chemical.

Step Two: Dose-Response Assessment

Paracelsus, the Swiss physician and alchemist, the "father" of modern toxicology (1493-1541) said,

> "The dose makes the poison."

In other words, **the amount of a substance a person is exposed to** is as important as **how toxic the chemical might be**. For example, small doses of aspirin can be beneficial to people, but at very high doses, this common medicine can be deadly. In some individuals, even at very low doses, aspirin may be deadly.

Dose-response assessment involves considering the dose levels at which adverse effects were observed in test animals, and using these dose levels to calculate an equal dose in humans.

Step Three: Exposure Assessment

People can be exposed to pesticides in three ways:

1. Inhaling pesticides (inhalation exposure),
2. Absorbing pesticides through the skin (dermal exposure), and
3. Getting pesticides in their mouth or digestive tract (oral exposure).

Depending on the situation, pesticides could enter the body by any one or all of these routes. Typical sources of pesticide exposure include:

- **Food**
  Most of the foods we eat have been grown with the use of pesticides. Therefore, pesticide residues may be present inside or on the surfaces of these foods.

- **Home and Personal Use Pesticides**
  You might use pesticides in and around your home to control insects, weeds, mold, mildew, bacteria, lawn and garden pests and to protect your pets from pests such as fleas. Pesticides may also be used as insect repellants which are directly applied to the skin or clothing.

- **Pesticides in Drinking Water**
  Some pesticides that are applied to farmland or other land structures can make their way in small amounts to the ground water or surface water systems that feed drinking water supplies.

- **Worker Exposure to Pesticides**
  Pesticide applicators, vegetable and fruit pickers and others who work around pesticides can be exposed due to the nature of their jobs. To address the unique risks workers face from occupational exposure, EPA evaluates occupational exposure through a separate program. All pesticides registered by EPA have been shown to be safe when used properly.

Step Four: Risk Characterization

Risk characterization is the final step in assessing human health risks from pesticides. It is the process of combining the hazard, dose-response and exposure assessments to describe the overall risk from a pesticide. It explains the assumptions used in assessing exposure as well as the uncertainties that are built into the dose-response assessment. The strength of the overall database is considered, and broad

conclusions are made. EPA's role is to evaluate both toxicity and exposure and to determine the risk associated with use of the pesticide.

Simply put,

RISK = TOXICITY x EXPOSURE.

This means that the risk to human health from pesticide exposure depends on both the toxicity of the pesticide and the likelihood of people coming into contact with it. At least *some* exposure and *some* toxicity are required to result in a risk. For example, if the pesticide is very poisonous, but no people are exposed, there is no risk. Likewise, if there is ample exposure but the chemical is non-toxic, there is no risk. However, usually when pesticides are used, there is some toxicity and exposure, which results in a potential risk.

EPA recognizes that effects vary between animals of different species and from person to person. To account for this variability, *uncertainty factors* are built into the risk assessment. These uncertainty factors create an additional margin of safety for protecting people who may be exposed to the pesticides. FQPA requires EPA to use an extra 10-fold safety factor, if necessary, to protect infants and children from effects of the pesticide.

Types of Toxicity Tests EPA Requires for Human Health Risk Assessments

EPA evaluates studies conducted over different periods of time and that measure specific types of effects. These tests are evaluated to screen for potential health effects in infants, children and adults.

Acute Testing: Short-term exposure; a single exposure (dose).

- Oral, dermal (skin), and inhalation exposure
- Eye irritation
- Skin irritation
- Skin sensitization
- Neurotoxicity

Sub-chronic Testing: Intermediate exposure; repeated exposure over a longer period of time (i.e., 30-90 days).

- Oral, dermal (skin), and inhalation
- Neurotoxicity (nerve system damage)

Chronic Toxicity Testing: Long-term exposure; repeated exposure lasting for most of the test animal's life span. Intended to determine the effects of a pesticide after prolonged and repeated exposures.

- Chronic effects (non-cancer)
- Carcinogenicity (cancer)

Developmental and Reproductive Testing: Identify effects in the fetus of an exposed pregnant female (birth defects) and how pesticide exposure affects the ability of a test animal to successfully reproduce.

Mutagenicity Testing: Assess a pesticide's potential to affect the cell's genetic components.

Hormone Disruption: Measure effects for their potential to disrupt the endocrine system. The endocrine system consists of a set of glands and the hormones they produce that help guide the development, growth, reproduction, and behavior of animals including humans.

Risk Management

Once EPA completes the risk assessment process for a pesticide, we use this information to determine if (when used according to label directions), there is a reasonable certainty that the pesticide will not harm a person's health.

Using the conclusions of a risk assessment, EPA can then make a more informed decision regarding whether to approve a pesticide chemical or use, as proposed, or whether additional protective measures are necessary to limit occupational or non-occupational exposure to a pesticide. For example, EPA may prohibit a pesticide from being used on certain crops because consuming too much food treated with the pesticide may result in an unacceptable risk to consumers. Another example of protective measures is requiring workers to wear personal protective equipment (PPE) such as a respirator or chemical resistant gloves, or not allowing workers to enter treated crop fields until a specific period of time has passed.

If, after considering all appropriate risk reduction measures, the pesticide still does not meet EPA's safety standard, the Agency will not allow the proposed chemical or use. Regardless of the specific measures enforced, EPA's primary goal is to ensure that legal uses of the pesticide are protective of human health, especially the health of children, and the environment.

Human Health Risk Assessment and the Law

Federal law requires detailed evaluation of pesticides to protect human health and the environment. In 1996, Congress made significant changes to strengthen pesticide laws through the Food Quality Protection Act (FQPA). Many of these changes are key elements of the current risk assessment process. FQPA required that EPA consider:

- **A New Safety Standard**: FQPA strengthened the safety standard that pesticides must meet before being approved for use. EPA must ensure with a reasonable certainty that no harm will result from the legal uses of the pesticide.
- **Exposure from All Sources**: In evaluating a pesticide, EPA must estimate the combined risk from that pesticide from all non-occupational sources, such as:
  - Food Sources
  - Drinking Water Sources
  - Residential Sources
- **Cumulative Risk**: EPA is required to evaluate pesticides in light of similar toxic effects that different pesticides may share, or "a common mechanism of toxicity." At this time, EPA is developing a methodology for this type of assessment.
- **Special Sensitivity of Children to Pesticides**: EPA must ascertain whether there is an increased susceptibility from exposure to the pesticide to infants and children. EPA must build an additional 10-fold safety factor into risk assessments to ensure the protection of infants and children, unless it is determined that a lesser margin of safety will be safe for infants and children.

For More Information

If you would like more information about EPA's pesticide programs, contact the Communication Service Branch at (703) 305-5017 or visit the Pesticides Web site.

For more information on specific pesticides, or to inquire about the symptoms of pesticide poisoning, call the National Pesticide Information Center (NPIC), a toll-free hotline information at: 1-800-858-7378, or visit their Web site EXIT Disclaimer .

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

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February 2001

ToxFAQs™ for Polychlorinated Biphenyls (PCBs)

(Bifenilos Policlorados (BPCs))

This fact sheet answers the most frequently asked health questions about polychlorinated biphenyls (PCBs). For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls (PCBs)?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors,

Contact Information

RELATED RESOURCES

ToxFAQ™ 35k

ToxFAQ™ en Español 32k

Public Health Statement 125k

Public Health Statement en Español 321k

Toxicological Profile 13.6MB

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Division of Toxicology

and old microscope and hydraulic oils.

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What happens to polychlorinated biphenyls (PCBs) when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

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How might I be exposed to polychlorinated biphenyls (PCBs)?

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

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How can polychlorinated biphenyls (PCBs) affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

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How likely are polychlorinated biphenyls (PCBs) to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

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How do polychlorinated biphenyls (PCBs) affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

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How can families reduce the risk of exposure to polychlorinated biphenyls (PCBs)?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.
- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

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Is there a medical test to show whether I've been exposed to polychlorinated biphenyls (PCBs)?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

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Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

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References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333
Phone: 1-888-42-ATSDR (1-888-422-8737)
FAX: (770)-488-4178
Email: ATSDRIC@cdc.gov

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ATSDR Department of Health and Human Services
Agency for Toxic Substances & Disease Registry

2007 CERCLA Priority List of Hazardous Substances

2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
1	ARSENIC	1672.58	1	007440-38-2
2	LEAD	1534.07	2	007439-92-1
3	MERCURY	1504.69	3	007439-97-6
4	VINYL CHLORIDE	1387.75	4	000075-01-4
5	POLYCHLORINATED BIPHENYLS	1365.78	5	001336-36-3
6	BENZENE	1355.96	6	000071-43-2
7	CADMIUM	1324.22	8	007440-43-9
8	POLYCYCLIC AROMATIC HYDROCARBONS	1316.98	7	130498-29-2
9	BENZO(A)PYRENE	1312.45	9	000050-32-8
10	BENZO(B)FLUORANTHENE	1266.55	10	000205-99-2
11	CHLOROFORM	1223.03	11	000067-66-3
12	DDT, P,P'-	1193.36	12	000050-29-3
13	AROCLOR 1254	1182.63	13	011097-69-1
14	AROCLOR 1260	1177.77	14	011096-82-5
15	DIBENZO(A,H)ANTHRACENE	1165.88	15	000053-70-3
16	TRICHLOROETHYLENE	1154.73	16	000079-01-6
17	DIELDRIN	1150.91	17	000060-57-1
18	CHROMIUM, HEXAVALENT	1149.98	18	018540-29-9
19	PHOSPHORUS, WHITE	1144.77	19	007723-14-0
20	CHLORDANE	1133.21	21	000057-74-9
21	DDE, P,P'-	1132.49	20	000072-55-9
22	HEXACHLOROBUTADIENE	1129.63	22	000087-68-3
23	COAL TAR CREOSOTE	1124.32	23	008001-58-9
24	ALDRIN	1117.22	25	000309-00-2
25	DDD, P,P'-	1114.83	24	000072-54-8
26	BENZIDINE	1114.24	26	000092-87-5
27	AROCLOR 1248	1112.20	27	012672-29-6
28	CYANIDE	1099.48	28	000057-12-5
29	AROCLOR 1242	1093.14	29	053469-21-9
30	AROCLOR	1091.52	62	012767-79-2
31	TOXAPHENE	1086.65	30	008001-35-2
32	HEXACHLOROCYCLOHEXANE, GAMMA-	1081.63	32	000058-89-9
33	TETRACHLOROETHYLENE	1080.43	31	000127-18-4
34	HEPTACHLOR	1072.67	33	000076-44-8
35	1,2-DIBROMOETHANE	1064.06	34	000106-93-4
36	HEXACHLOROCYCLOHEXANE, BETA-	1060.22	37	000319-85-7
37	ACROLEIN	1059.07	36	000107-02-8
38	DISULFOTON	1058.85	35	000298-04-4
39	BENZO(A)ANTHRACENE	1057.96	38	000056-55-3
40	3,3'-DICHLOROBENZIDINE	1051.61	39	000091-94-1

41	ENDRIN	1048.57	41	000072-20-8
42	BERYLLIUM	1046.12	40	007440-41-7
43	HEXACHLOROCYCLOHEXANE, DELTA-	1038.27	42	000319-86-8
44	1,2-DIBROMO-3-CHLOROPROPANE	1035.55	43	000096-12-8
45	PENTACHLOROPHENOL	1028.01	45	000087-86-5
46	HEPTACHLOR EPOXIDE	1027.12	44	001024-57-3
47	CARBON TETRACHLORIDE	1023.32	46	000056-23-5
48	AROCLOR 1221	1018.41	47	011104-28-2
49	COBALT	1015.57	50	007440-48-4
50	DDT, O,P'-	1014.71	49	000789-02-6
51	AROCLOR 1016	1014.33	48	012674-11-2
52	DI-N-BUTYL PHTHALATE	1007.49	52	000084-74-2
53	NICKEL	1005.40	55	007440-02-0
54	ENDOSULFAN	1004.65	54	000115-29-7
55	ENDOSULFAN SULFATE	1003.56	53	001031-07-8
56	DIAZINON	1002.08	57	000333-41-5
57	ENDOSULFAN, ALPHA	1001.30	58	000959-98-8
58	XYLENES, TOTAL	996.07	59	001330-20-7
59	CIS-CHLORDANE	995.08	51	005103-71-9
60	DIBROMOCHLOROPROPANE	994.87	60	067708-83-2
61	METHOXYCHLOR	994.47	61	000072-43-5
62	BENZO(K)FLUORANTHENE	981.26	63	000207-08-9
63	ENDRIN KETONE	978.99	64	053494-70-5
64	TRANS-CHLORDANE	973.99	56	005103-74-2
65	CHROMIUM(VI) OXIDE	969.58	66	001333-82-0
66	METHANE	959.78	67	000074-82-8
67	ENDOSULFAN, BETA	959.19	65	033213-65-9
68	AROCLOR 1232	955.64	68	011141-16-5
69	ENDRIN ALDEHYDE	954.86	69	007421-93-4
70	BENZOFLUORANTHENE	951.48	70	056832-73-6
71	TOLUENE	947.50	71	000108-88-3
72	2-HEXANONE	942.02	72	000591-78-6
73	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	938.11	73	001746-01-6
74	ZINC	932.89	74	007440-66-6
75	DIMETHYLARSINIC ACID	922.06	75	000075-60-5
76	DI(2-ETHYLHEXYL)PHTHALATE	919.02	76	000117-81-7
77	CHROMIUM	908.52	77	007440-47-3
78	NAPHTHALENE	896.67	78	000091-20-3
79	1,1-DICHLOROETHENE	891.19	79	000075-35-4
80	METHYLENE CHLORIDE	888.96	81	000075-09-2
81	AROCLOR 1240	888.11	80	071328-89-7
82	2,4,6-TRINITROTOLUENE	883.59	82	000118-96-7
83	BROMODICHLOROETHANE	870.00	83	000683-53-4
84	HYDRAZINE	864.41	85	000302-01-2
85	1,2-DICHLOROETHANE	863.99	84	000107-06-2
86	2,4,6-TRICHLOROPHENOL	863.71	86	000088-06-2
87	2,4-DINITROPHENOL	860.45	87	000051-28-5
88	BIS(2-CHLOROETHYL) ETHER	859.88	88	000111-44-4
89	THIOCYANATE	849.21	89	000302-04-5
90	ASBESTOS	841.54	90	001332-21-4
91	CHLORINE	840.37	92	007782-50-5
92	CYCLOTRIMETHYLENETRINITRAMINE (RDX)	840.28	91	000121-82-4
93	HEXACHLOROBENZENE	838.34	93	000118-74-1

94	2,4-DINITROTOLUENE	837.88	96	000121-14-2
95	RADIUM-226	835.93	94	013982-63-3
96	ETHION	834.03	97	000563-12-2
97	1,1,1-TRICHLOROETHANE	833.81	95	000071-55-6
98	URANIUM	833.41	98	007440-61-1
99	ETHYLBENZENE	832.13	99	000100-41-4
100	RADIUM	828.07	100	007440-14-4
101	THORIUM	825.17	101	007440-29-1
102	4,6-DINITRO-O-CRESOL	822.78	102	000534-52-1
103	1,3,5-TRINITROBENZENE	820.17	103	000099-35-4
104	CHLOROBENZENE	819.69	105	000108-90-7
105	RADON	817.89	104	010043-92-2
106	RADIUM-228	816.76	106	015262-20-1
107	THORIUM-230	814.72	107	014269-63-7
107	URANIUM-235	814.72	107	015117-96-1
109	BARIUM	813.46	109	007440-39-3
110	FLUORANTHENE	812.40	113	000206-44-0
111	URANIUM-234	812.11	110	013966-29-5
112	N-NITROSODI-N-PROPYLAMINE	811.05	111	000621-64-7
113	THORIUM-228	810.36	112	014274-82-9
114	RADON-222	809.78	114	014859-67-7
115	HEXACHLOROCYCLOHEXANE, ALPHA-	809.56	116	000319-84-6
116	1,2,3-TRICHLOROBENZENE	808.41	143	000087-61-6
117	MANGANESE	807.90	115	007439-96-5
118	COAL TARS	807.07	117	008007-45-2
119	CHRYSOTILE ASBESTOS	806.68	119	012001-29-5
119	STRONTIUM-90	806.68	119	010098-97-2
121	PLUTONIUM-239	806.67	118	015117-48-3
122	POLONIUM-210	806.39	122	013981-52-7
123	METHYLMERCURY	806.39	121	022967-92-6
124	PLUTONIUM-238	806.01	123	013981-16-3
125	LEAD-210	805.90	124	014255-04-0
126	PLUTONIUM	805.23	125	007440-07-5
127	CHLORPYRIFOS	804.93	125	002921-88-2
128	COPPER	804.86	133	007440-50-8
129	AMERICIUM-241	804.55	128	086954-36-1
130	RADON-220	804.54	127	022481-48-7
131	AMOSITE ASBESTOS	804.07	129	012172-73-5
132	IODINE-131	803.48	130	010043-66-0
133	HYDROGEN CYANIDE	803.08	132	000074-90-8
134	TRIBUTYLTIN	802.61	131	000688-73-3
135	GUTHION	802.32	134	000086-50-0
136	NEPTUNIUM-237	802.13	135	013994-20-2
137	CHRYSENE	802.10	139	000218-01-9
138	CHLORDECONE	801.64	136	000143-50-0
138	IODINE-129	801.64	136	015046-84-1
138	PLUTONIUM-240	801.64	136	014119-33-6
141	S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	797.88	140	000078-48-8
142	BROMINE	789.15	142	007726-95-6
143	POLYBROMINATED BIPHENYLS	789.11	141	067774-32-7
144	DICOFOL	787.56	144	000115-32-2
145	PARATHION	784.14	145	000056-38-2
146	1,1,2,2-TETRACHLOROETHANE	782.15	146	000079-34-5

147	SELENIUM	778.98	147	007782-49-2
148	HEXACHLOROCYCLOHEXANE, TECHNICAL GRADE	774.91	148	000608-73-1
149	TRICHLOROFLUOROETHANE	770.74	149	027154-33-2
150	TRIFLURALIN	770.12	150	001582-09-8
151	DDD, O,P'-	768.73	151	000053-19-0
152	4,4'-METHYLENEBIS(2-CHLOROANILINE)	766.66	152	000101-14-4
153	HEXACHLORODIBENZO-P-DIOXIN	760.42	153	034465-46-8
154	HEPTACHLORODIBENZO-P-DIOXIN	754.47	154	037871-00-4
155	PENTACHLOROBENZENE	753.58	155	000608-93-5
156	1,3-BUTADIENE	747.31	201	000106-99-0
157	AMMONIA	745.55	156	007664-41-7
158	2-METHYLNAPHTHALENE	743.24	157	000091-57-6
159	1,4-DICHLOROBENZENE	737.32	159	000106-46-7
160	1,1-DICHLOROETHANE	736.23	158	000075-34-3
161	ACENAPHTHENE	731.25	160	000083-32-9
162	1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN	726.14	161	039001-02-0
163	1,1,2-TRICHLOROETHANE	724.96	162	000079-00-5
164	TRICHLOROETHANE	723.32	163	025323-89-1
165	HEXACHLOROCYCLOPENTADIENE	719.01	164	000077-47-4
166	HEPTACHLORODIBENZOFURAN	718.58	165	038998-75-3
167	1,2-DIPHENYLHYDRAZINE	713.90	166	000122-66-7
168	2,3,4,7,8-PENTACHLORODIBENZOFURAN	710.71	167	057117-31-4
169	TETRACHLOROBIPHENYL	709.21	168	026914-33-0
170	CRESOL, PARA-	707.83	169	000106-44-5
171	OXYCHLORDANE	706.32	170	027304-13-8
172	1,2-DICHLOROBENZENE	704.91	171	000095-50-1
173	1,2-DICHLOROETHENE, TRANS-	704.04	178	000156-60-5
174	INDENO(1,2,3-CD)PYRENE	703.30	180	000193-39-5
175	GAMMA-CHLORDENE	702.59	172	056641-38-4
176	CARBON DISULFIDE	702.55	174	000075-15-0
177	TETRACHLOROPHENOL	702.54	173	025167-83-3
178	AMERICIUM	701.62	175	007440-35-9
178	URANIUM-233	701.62	175	013968-55-3
180	PALLADIUM	700.66	177	007440-05-3
181	HEXACHLORODIBENZOFURAN	700.56	179	055684-94-1
182	PHENOL	696.96	183	000108-95-2
183	CHLOROETHANE	693.90	182	000075-00-3
184	ACETONE	693.31	181	000067-64-1
185	P-XYLENE	690.20	185	000106-42-3
186	DIBENZOFURAN	689.19	187	000132-64-9
187	ALUMINUM	688.13	186	007429-90-5
188	2,4-DIMETHYLPHENOL	685.76	189	000105-67-9
189	CARBON MONOXIDE	684.49	188	000630-08-0
190	TETRACHLOROETHANE	677.97	190	025322-20-7
191	HYDROGEN SULFIDE	676.51	193	007783-06-4
192	PENTACHLORODIBENZOFURAN	673.21	192	030402-15-4
193	CHLOROMETHANE	670.19	191	000074-87-3
194	BIS(2-METHOXYETHYL) PHTHALATE	666.08	194	034006-76-3
195	BUTYL BENZYL PHTHALATE	659.38	195	000085-68-7
196	CRESOL, ORTHO-	658.66	196	000095-48-7
197	HEXACHLOROETHANE	653.10	199	000067-72-1
198	VANADIUM	651.70	198	007440-62-2

199	N-NITROSODIMETHYLAMINE	650.71	200	000062-75-9
200	1,2,4-TRICHLOROBENZENE	647.30	203	000120-82-1
201	BROMOFORM	643.53	202	000075-25-2
202	TETRACHLORODIBENZO-P-DIOXIN	635.74	204	041903-57-5
203	1,3-DICHLOROBENZENE	631.41	205	000541-73-1
204	PENTACHLORODIBENZO-P-DIOXIN	625.12	207	036088-22-9
205	N-NITROSODIPHENYLAMINE	624.79	208	000086-30-6
206	1,2-DICHLOROETHYLENE	622.49	206	000540-59-0
207	2,3,7,8-TETRACHLORODIBENZOFURAN	622.15	210	051207-31-9
208	2-BUTANONE	620.01	209	000078-93-3
209	2,4-DICHLOROPHENOL	616.45	212	000120-83-2
210	1,4-DIOXANE	616.29	215	000123-91-1
211	FLUORINE	613.28	214	007782-41-4
212	NITRITE	612.64	216	014797-65-0
213	CESIUM-137	612.50	217	010045-97-3
214	SILVER	612.19	213	007440-22-4
215	CHROMIUM TRIOXIDE	610.85	218	007738-94-5
216	NITRATE	610.66	219	014797-55-8
217	POTASSIUM-40	608.91	220	013966-00-2
218	DINITROTOLUENE	607.65	221	025321-14-6
219	ANTIMONY	605.37	222	007440-36-0
220	COAL TAR PITCH	605.33	224	065996-93-2
221	THORIUM-227	605.32	223	015623-47-9
222	2,4,5-TRICHLOROPHENOL	604.83	225	000095-95-4
223	ARSENIC ACID	604.45	226	007778-39-4
224	ARSENIC TRIOXIDE	604.36	227	001327-53-3
225	PHORATE	603.10	228	000298-02-2
226	BENZOPYRENE	603.00	230	073467-76-2
227	CRESOLS	602.74	229	001319-77-3
228	CHLORDANE, TECHNICAL	602.62	231	012789-03-6
229	DIMETHOATE	602.61	232	000060-51-5
230	ACTINIUM-227	602.57	233	014952-40-0
230	STROBANE	602.57	233	008001-50-1
232	4-AMINOBIPHENYL	602.51	235	000092-67-1
232	PYRETHRUM	602.51	235	008003-34-7
234	ARSINE	602.42	237	007784-42-1
235	NALED	602.32	238	000300-76-5
236	DIBENZOFURANS, CHLORINATED	602.13	239	042934-53-2
236	ETHOPROP	602.13	239	013194-48-4
238	ALPHA-CHLORDENE	601.94	241	056534-02-2
238	CARBOPHENOTHION	601.94	241	000786-19-6
240	DICHLORVOS	601.64	243	000062-73-7
241	CALCIUM ARSENATE	601.45	244	007778-44-1
241	MERCURIC CHLORIDE	601.45	244	007487-94-7
241	SODIUM ARSENITE	601.45	244	007784-46-5
244	FORMALDEHYDE	599.64	247	000050-00-0
245	2-CHLOROPHENOL	599.62	248	000095-57-8
246	PHENANTHRENE	597.68	249	000085-01-8
247	HYDROGEN FLUORIDE	588.03	250	007664-39-3
248	2,4-D ACID	584.47	251	000094-75-7
249	DIBROMOCHLOROMETHANE	580.59	252	000124-48-1
250	DIURON	579.16	253	000330-54-1
251	BUTYLATE	578.43	254	002008-41-5

252	DIMETHYL FORMAMIDE	578.23	255	000068-12-2
253	PYRENE	577.95	256	000129-00-0
254	DICHLOROBENZENE	577.70	211	025321-22-6
255	ETHYL ETHER	572.47	257	000060-29-7
256	DICHLOROETHANE	570.46	258	001300-21-6
257	4-NITROPHENOL	567.79	259	000100-02-7
258	1,3-DICHLOROPROPENE, CIS-	561.82	184	010061-01-5
259	PHOSPHINE	559.74	260	007803-51-2
260	TRICHLOROBENZENE	557.96	261	012002-48-1
261	2,6-DINITROTOLUENE	555.20	262	000606-20-2
262	FLUORIDE ION	549.64	263	016984-48-8
263	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	547.90	264	035822-46-9
264	METHYL PARATHION	545.83	265	000298-00-0
265	PENTAERYTHRITOL TETRANITRATE	545.59	266	000078-11-5
266	1,3-DICHLOROPROPENE, TRANS-	543.37	267	010061-02-6
267	BIS(2-ETHYLHEXYL)ADIPATE	540.20	268	000103-23-1
268	CARBAZOLE	534.52	269	000086-74-8
269	METHYL ISOBUTYL KETONE	533.24	271	000108-10-1
270	1,2-DICHLOROETHENE, CIS-	533.15	270	000156-59-2
271	STYRENE	532.70	272	000100-42-5
272	CARBARYL	530.98	273	000063-25-2
273	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	529.45	274	067562-39-4
274	ACRYLONITRILE	528.28	275	000107-13-1
275	1-METHYLNAPHTHALENE	526.51	NEW	

Substances were assigned the same rank when two (or more) substances received equivalent total point scores.

CAS #= Chemical Abstracts Service Registry Number

This page was updated on 01/10/2008

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/23/2019 Version Number 2 Reviewed on 03/23/2019

*

1 Identification

· **Product identifier**

· **Trade name: Perfluorooctanoic Acid (PFOA)**

· **Part number:** N-1588
· **CAS Number:**
335-67-1
· **EC number:**
206-397-9
· **Index number:**
607-704-00-2
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

*

2 Hazard(s) identification

· **Classification of the substance or mixture**

GHS08 Health hazard

Carc. 2	H351	Suspected of causing cancer.
Repr. 1B	H360	May damage fertility or the unborn child.
STOT RE 1	H372	Causes damage to the liver through prolonged or repeated exposure.

GHS05 Corrosion

Eye Dam. 1	H318	Causes serious eye damage.

GHS07

Acute Tox. 4	H302	Harmful if swallowed.
Acute Tox. 4	H332	Harmful if inhaled.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).

(Contd. on page 2)

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/23/2019 Version Number 2 Reviewed on 03/23/2019

Trade name: Perfluorooctanoic Acid (PFOA)

(Contd. of page 1)

· **Hazard pictograms**

GHS05 GHS07 GHS08

· **Signal word** Danger

· **Hazard-determining components of labeling:**
perfluorooctanoic acid (PFOA)
· **Hazard statements**
Harmful if swallowed or if inhaled.
Causes serious eye damage.
Suspected of causing cancer.
May damage fertility or the unborn child.
Causes damage to the liver through prolonged or repeated exposure.
· **Precautionary statements**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust/fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/protective clothing/eye protection/face protection.
If swallowed: Call a poison center/doctor if you feel unwell.
Rinse mouth.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.
Continue rinsing.
Immediately call a poison center/doctor.
IF exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.
Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.
· **Classification system:**
· **NFPA ratings (scale 0 - 4)**

Health = 3
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = *3
Fire = 0
Reactivity = 0

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

(Contd. on page 3)

(Contd. of page 2)

· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
335-67-1 perfluorooctanoic acid (PFOA)
· **Identification number(s)**
· **EC number:** 206-397-9
· **Index number:** 607-704-00-2

4 First-aid measures

· **Description of first aid measures**
· **General information:**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
· **After inhalation:**
Supply fresh air. If required, provide artificial respiration. Keep patient warm. Consult doctor if symptoms persist.
In case of unconsciousness place patient stably in side position for transportation.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water. Then consult a doctor.
· **After swallowing:** Immediately call a doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture**
During heating or in case of fire poisonous gases are produced.
· **Advice for firefighters**
· **Protective equipment:** Mouth respiratory protective device.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures**
Mount respiratory protective device.
Wear protective equipment. Keep unprotected persons away.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Use neutralizing agent.
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.

(Contd. on page 4)

(Contd. of page 3)

· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
· **Protective Action Criteria for Chemicals**

· **PAC-1:**
1.1 mg/m³
· **PAC-2:**
12 mg/m³
· **PAC-3:**
75 mg/m³

7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Thorough dedusting.
Ensure good ventilation/exhaustion at the workplace.
Open and handle receptacle with care.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Keep receptacle tightly sealed.
· **Specific end use(s)** No further relevant information available.

*
8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**
· **Components with limit values that require monitoring at the workplace:** Not required.
· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
Avoid contact with the eyes.
Avoid contact with the eyes and skin.
· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.

(Contd. on page 5)

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· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.
· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours
· **Eye protection:**

Tightly sealed goggles

9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Solid
Color:	Not determined.
· **Odor:**	Characteristic
· **Odor threshold:**	Not determined.
· **pH-value:**	Not applicable.
· **Change in condition**	
Melting point/Melting range:	55-56 °C (131-132.8 °F)
Boiling point/Boiling range:	190 °C (374 °F)
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Product is not flammable.
· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure at 20 °C (68 °F):**	0.69 hPa (0.5 mm Hg)
· **Density at 20 °C (68 °F):**	0.9 g/cm³ (7.5105 lbs/gal)
· **Relative density**	Not determined.
· **Vapor density**	Not applicable.

(Contd. on page 6)

(Contd. of page 5)

· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with Water at 20 °C (68 °F):**	3.4 g/l
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
Solids content:	100.0 %
· **Other information**	No further relevant information available.

10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known.

11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**

ATE (Acute Toxicity Estimate)

Oral	LD50	500 mg/kg
Inhalative	LC50/4 h	1.5 mg/L

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** Strong irritant with the danger of severe eye injury.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**

2B

· **NTP (National Toxicology Program)**

Substance is not listed.

(Contd. on page 7)

(Contd. of page 6)

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 2 (Assessment by list): hazardous for water
Do not allow product to reach ground water, water course or sewage system.
Must not reach bodies of water or drainage ditch undiluted or unneutralized.
Danger to drinking water if even small quantities leak into the ground.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN3261
· **UN proper shipping name**	
· **DOT**	Corrosive solid, acidic, organic, n.o.s. (perfluorooctanoic acid (PFOA))
· **IMDG, IATA**	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (perfluorooctanoic acid (PFOA))

(Contd. on page 8)

(Contd. of page 7)

· **Transport hazard class(es)**

· **IATA**

· **Class**	8 Corrosive substances
· **Label**	8
· **Environmental hazards:**	Not applicable.
· **Special precautions for user**	Warning: Corrosive substances
· **Danger code (Kemler):**	80
· **EMS Number:**	F-A,S-B
· **Segregation groups**	Acids
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 25 kg On cargo aircraft only: 100 kg
· **IMDG**	
· **Limited quantities (LQ)**	5 kg
· **Excepted quantities (EQ)**	Code: E1 Maximum net quantity per inner packaging: 30 g Maximum net quantity per outer packaging: 1000 g
· **UN "Model Regulation":**	UN 3261 CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (PERFLUOROOCTANOIC ACID (PFOA)), 8, III

15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **Sara**

· **Section 355 (extremely hazardous substances):**

Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**

Substance is not listed.

· **TSCA (Toxic Substances Control Act):**

Substance is listed.

· **Proposition 65**

· **Chemicals known to cause cancer:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**

Substance is not listed.

(Contd. on page 9)

(Contd. of page 8)

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**
Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**
Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
Substance is not listed.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

*
16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation.
No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

· **Date of preparation / last revision** 03/23/2019 / 1

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
Acute Tox. 4: Acute toxicity – Category 4
Eye Dam. 1: Serious eye damage/eye irritation – Category 1
Carc. 2: Carcinogenicity – Category 2
Repr. 1B: Reproductive toxicity – Category 1B
STOT RE 1: Specific target organ toxicity (repeated exposure) – Category 1

· *** Data compared to the previous version altered.**

Appendix G

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN

3083 Webster Ave BCP Site

3083 Webster Avenue
Block 3331; Lot 57
Bronx New York

NYSDEC Site Number: C203184

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2.0 Project Objective and Scope of Work.....2
2.1 Post Excavation End-Point Soil Sampling.....2
2.2 Post Remediation Groundwater Sampling.....2
3.0 Sampling Procedures 3
4.0 Decontamination Procedures 4
5.0 Quality Assurance and Quality Controls 4
6.0 General QA/QC Considerations 4

Tables

1. Sampling and Analytical Method Requirements for End Point Soil Samples
2. Sampling and Analytical Method Requirements for Groundwater

Figures

1. Proposed Post Excavation End Point Soil Sampling Plan
2. Proposed Post Remediation Groundwater Sampling Plan

Attachments

A. Low Flow Sampling Protocol And Monitoring Well Purge/Sampling Form
B. Resume of Key Personnel Involved With This Project
C. Sample Chain of Custody Form
D. Conventional Laboratory QA/QC

1.0 Introduction

This Quality Assurance Project Plan (QAPP) has been prepared for the samples to be collected as part of the Brownfield Cleanup Program (BCP) Interim Remedial Action Work Plan (RAWP) for 3083 Webster Ave BCP Site located at 3083 Webster Avenue in the Bronx, New York (Site # C203184). The intent of the QAPP is to ensure that (1) proper equipment handling and maintenance is followed, (2) cross-contamination between sampling locations does not occur, (3) standard number of quality control samples are obtained, (4) proper procedures for samples custody are performed and (5), data review, validation and verification requirements are complete.

All related portions of the fieldwork will be performed, at a minimum, in accordance with acceptable industry standards. These acceptable industry standards include, but are not limited to, the ASTM Standard Guide for Phase II Environmental Site Assessments (E 1903-97), the New York State Department of Environmental Conservation (NYSDEC) Bureau of Spill Prevention & Response Sampling Guidelines and Protocols, March 1991, NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation, May 2010, 6 NYCRR Subpart 360, and NYSDEC Guidance For Sampling Analysis And Assessment of Per-And Polyfluoroalkyl Substances (PFAS) - April 2023.

2.0 Project Objective and Scope of Work

2.1 Post Excavation End-Point Soil Sampling

A total of twenty-eight (28) post soil excavation confirmation end-point samples including 12 bottom samples designated EP-B-1 to EP-B-12, and 16 sidewall samples designated EP-W-1 to EP-W-16 be collected at the Site. The end-point soil samples will be obtained directly from undisturbed soil from the bottom of excavation. Excavation will be paused and the end-point sample will be collected when the limits of sampling requirement are met with each bottom sample representing 900 square feet. In all cases, post remediation samples should be biased toward locations and depths of the highest expected contamination identified during previous sampling episodes utilizing field indicators such as field instrument measurements or visual contamination identified during the soil screening. It should be noted that grab VOC samples will be collected from 0 to 6 inches below final bottom grade within 24 hours of completing the excavation and 6 to 12 inches below final bottom grade past the 24 hours of completing the excavation. The location of the end point soil samples is provided in **Figure 1** provides a post excavation end-points soil sampling plan.

This end-point investigation will be performed in accordance to the New York State Department of Environmental Conservation (NYSDEC) requirements under the NYS Brownfield Cleanup Program (BCP) and in compliance with the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (May 2010) and other acceptable industry standards.

2.2 Post Remediation Groundwater Sampling

Following the treatment of residual gasoline compounds in groundwater beneath the southern portion of the Site via bioremedial injections, a groundwater monitoring program will be implemented as part of Site remedial action. This program includes eight (8) rounds of quarterly

groundwater sampling events. During each quarterly event, three (3) groundwater samples will be obtained from three existing monitoring well MW-4a, MW-5a and MW-7 located in the vicinity of the treatment area in the southern portion of the Site. These three wells will be maintained during Site construction activities. Any well destroyed during the layout of building foundations, it will be re-installed in accordance with the Remedial Investigation Work Plan Addendum dated July 2025. The groundwater sampling will be performed utilizing a low flow pump fitted with dedicated polyethylene tubing. Initially, the monitoring well will be purged prior to sampling. Purging and sampling of the monitoring wells will be conducted according to USEPA's Low Stress/Flow Groundwater Sampling Protocol (SOP #GW0001, Rev. 1996) utilizing a portable Horiba U-52 water quality meter which utilizes an in-line flow cell for water quality indicator measurements (the USEPA low flow sampling protocol and monitoring well purge/sampling form is provided in **Attachment A**). Groundwater will be purged at a low flow rate of less than 500 milliliter per minute (mL/min) until water quality indicator parameters including pH, temperature, specific conductivity, oxidation reduction potential, dissolved oxygen and turbidity are stabilized. The sampling of each well will be performed once groundwater purging is completed. **Figure 2** provides post-remediation groundwater sampling plan.

3.0 Sampling Procedures

All soil and groundwater samples will be placed directly into pre-cleaned containers provided by the laboratory. Samples containers will be labeled and placed in a cooler filled with ice and maintained at 4 degrees Celsius. Each sample will be transmitted under proper chain of custody procedures to a NYSDOH ELAP-certified laboratory for analysis. **Table 1** and **Table 2** provide the sample containers, volumes, test methods, preservation techniques, reporting limits and holding times for soil and groundwater samples.

4.0 Decontamination Procedures

During the field sampling, end-point samples will be collected using dedicated samplers including by not limited to hand gloves. In the event non-dedicated sampling equipment will be used, Paul Matli, who is a Project Manager (PM) at Hydro Tech will be responsible for monitoring the decontamination procedure of every piece of the sampling equipment prior to each use by field personnel. The following procedure will be implemented during the decontamination process:

- Wipe clean and wash with Alconox®
- Potable water rinse
- Methanol rinse
- Deionized water rinse
- Air dry

All decontamination procedures will be performed in an area segregated from any sampling areas. Any rinsate from the decontamination area will be contained and removed from the Site.

5.0 Quality Assurance and Quality Control (QA/QC)

The following Quality Assurance and Quality Control (QA/QC) samples will also be collected and analyzed for the soil and groundwater samples.

- One trip blank per trip will be analyzed via EPA Method 8260
- Since the end-point soil sampling involves the use of dedicated samplers, cross contamination is unlikely to occur and as such, field equipment blanks will be not required during each day of sampling.
- One equipment blank (rinsate blank) for groundwater sampling will be analyzed via EPA Method 8260.

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) samples will also be collected and analyzed.

- One MS soil sample and One MSD soil sample will be analyzed via EPA Method 8260, EPA Method 8270, EPA Method 8081, EPA Method 8151, EPA Method 8082, EPA Method 6010 and EPA Method 7471 and also EPA Method 8270D SIM and EPA Method 1633.
- One MS groundwater sample and one MSD groundwater sample will be analyzed via EPA Method 8260

A summary of anticipated QA/QC for soil samples is included in **Table 1**. A summary of anticipated QA/QC for groundwater samples is included in **Table 2**.

6.0 General QA/QC Considerations

The soil and groundwater samples will be managed as per the following protocols:

- HydroTech PM (Paul I. Matli) and HydroTech assistant PM (Marie Rose Farah) shall perform field audits to verify compliance with the RAWP and identify corrective measures where problems are identified. Resume for Paul Matli and Marie Rose Farah are included in **Attachment B.**
- Samples will be labeled and logged in a monitor notebook and Chain of Custody upon collection including sampler name, sampling identification, date and time of sample collection and sampling depth, sampling methods and devices.
- In the field, samples will be the responsibility of, and will stay with, the H HydroTech PM (Paul I. Matli) and HydroTech assistant PM (Marie Rose Farah).
- Once samples have been collected, they will be either picked up directly from the field by laboratory courier or returned to HydroTech office and logged in for temporary storage. HydroTech staff will be responsible for transporting samples to State-certified (ELAP) laboratory for analysis under a proper Chain of Custody **Attachment C** provides a sample chain of custody form.
- Soil samples will be refrigerated to maintain a temperature at a maximum 4 degrees Celsius.

- Laboratory personnel will record the date and time of samples arrival at the lab and ensure that all holding times for each matrix and analysis will be met.
- After samples are analyzed, laboratory information is added to the label.
- The Sample Chain of Custody form will be used to record all transport and storage information.
- Samples analytical data report will undergo QA/QC performed by ALD Global laboratory QA officer who checks each data sheet for precision, missing or illegible information, errors in calculation and values outside of the expected range. A minimum of five percent of the total of a given type of sample shall be devoted to internal QC checks. These checks are designed to ensure accuracy in the sampling procedure and the analytical methods and include blanks, duplicates, matrix spikes reference standards and performance evaluation samples. **Attachment D** provides a conventional lab QA/QC procedures and NYSDOH ELAP-Certification for ALS Environmental Laboratories.
- All Laboratory data packages will conform to the Analytical Services Protocols (ASP) Category B Deliverables in accordance to NYSDEC DER-10 Appendix 2B.
- To ensure that data quality objectives are met, HydroTech PM will assess data precision, accuracy, degree of representation, comparability and completeness of samples and data. This is primarily accomplished in the evaluation of data together with fieldnotes and sampling logs. In order to ensure that cross-contamination between sampling locations did not occur, each piece of detection and reporting limits shall allow for comparison with soil quality standards.
- All deficiencies identified by HydroTech PM during the performance of field audits or evaluation of the data will be immediately reported to the field Geologist, and the NYSDEC. In addition to identifying deficiencies, the HydroTech PM is responsible for recommending corrective actions.
- The analytical data generated from this project will be provided in an electronic format in accordance with NYSDECs DER-10 Section 1.15. Specifically, the final reports shall be in an electronic format that complies with the NYSDEC's Electronic Document Standards (EDS).
- A Category B deliverable is required and a Data Usability Summary Report (DUSR) will be prepared. The DUSR will include all data and answer the following questions:
    1. Is the data package complete as defined under the requirements for the most current DEC ASP Category B or USEPA CLP data deliverables?
    2. Have all holding times been met?
    3. Do all the QC data; blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?
    4. Have all of the data been generated using established and agreed upon analytical protocols?
    5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?
    6. Have the correct data qualifiers been used and are they consistent with the most

current DEC ASP?

7. Have any quality control (QC) exceedances been specifically noted in the DUSR and have the corresponding QC summary sheets from the data package been attached to the DUSR?

- All validated data will be reviewed by Dr. Mohammed Al Qinna, an independent QAO, who is responsible of generating a data usability analysis. This analysis shall consist of (1) an assessment to determine if the data quality objectives were met; (2) evaluation of field duplicate results to indicate the samples are representative; (3) comparison of the results of trip blanks and methods blanks with full data sets to provide information concerning contaminants that may have been introduced during sampling, shipping or analyzing; (4) evaluation of matrix effects to assess the performance of the analytical method with respect to sample matrix, and determine whether the data have been biased high or low due to matrix effects. A Data Usability Summary Report (DUSR) will be prepared and provided in an electronic format in accordance to NYSDEC DER-10 Appendix 2B and in compliance with the NYSDEC's Electronic Document Standards (EDS). A resume for Dr. Mohammed Al Qinna is included in **Attachment B.**
- Field investigation will be performed under the full oversight of Tarek Z. Khouri, a NYS registered professional engineer. A resume for Tarek Z. Khouri is included in **Attachment B**.

Table 1: Sampling & Analytical Method Requirements For End-Point Soil Samples

Soil (1)	Parameters	Minimum Sample Volume	Sample Container	Sample Preservation	Analytical Method	Lab Reporting Limit	Technical Holding Time
Sample ID							
28 Soil Samples EP-B-1 to EP-B-12 & EP-W-1 to EP-W-16 & 1 Matrix Spike / 1 Matrix Spike Duplicate	TCL VOCs	120 ml + 2 OZ	2 oz. clear wide-mouth glass with Teflon lined septum + 40 ml methanol vial with Teflon lined cap + 40 ml DI water vial with Teflon lined cap + 40 ml unpreserved vial with Teflon lined cap	Cool to 4 °C(2)	EPA Method 8260	Compound Specific (0.001-0.05 mg/Kg)	14 days
	TCL SVOCs	8 OZ	8 oz. clear wide-mouth glass with Teflon lined septum	Cool to 4 °C	EPA Method 8270	Compound Specific (0.065-0.250 mg/Kg)	14 days
	TAL Metals	8 OZ	8 oz. clear wide-mouth glass with Teflon lined septum	Cool to 4 °C	EPA Method 6010/EPA 7470 for Mercury	Compound Specific (0.05-10 mg/Kg)	6 months/ Chromium Hexavalent 24 hours/Mercury
	PCBs	8 OZ	8 oz. clear wide-mouth glass with Teflon lined septum	Cool to 4 °C	EPA Method 8081	Compound Specific (0.025 mg/Kg)	14 days
	1,4 Dioxane	500 mL	4 oz. clear glass	Cool 4°C	EPA Method 8270	0.1 mg/Kg	14 days
	21 Target PFAS	500	500 ml ml HDPE or polypropylene	Cool to 4 °C	Modified EPA Method 537m	Compound Specific (≤0.5 µg/kg)	14 days
1 Trip Blank/ Per Shipment to Laboratory	TCL VOCs	80 ml	40 ml VOC vial with Teflon lined cap	1:1 HCL to pH<2 Cool to 4 °C	EPA Method 8260	Compound Specific (0.2-10 µg/L)	14 days

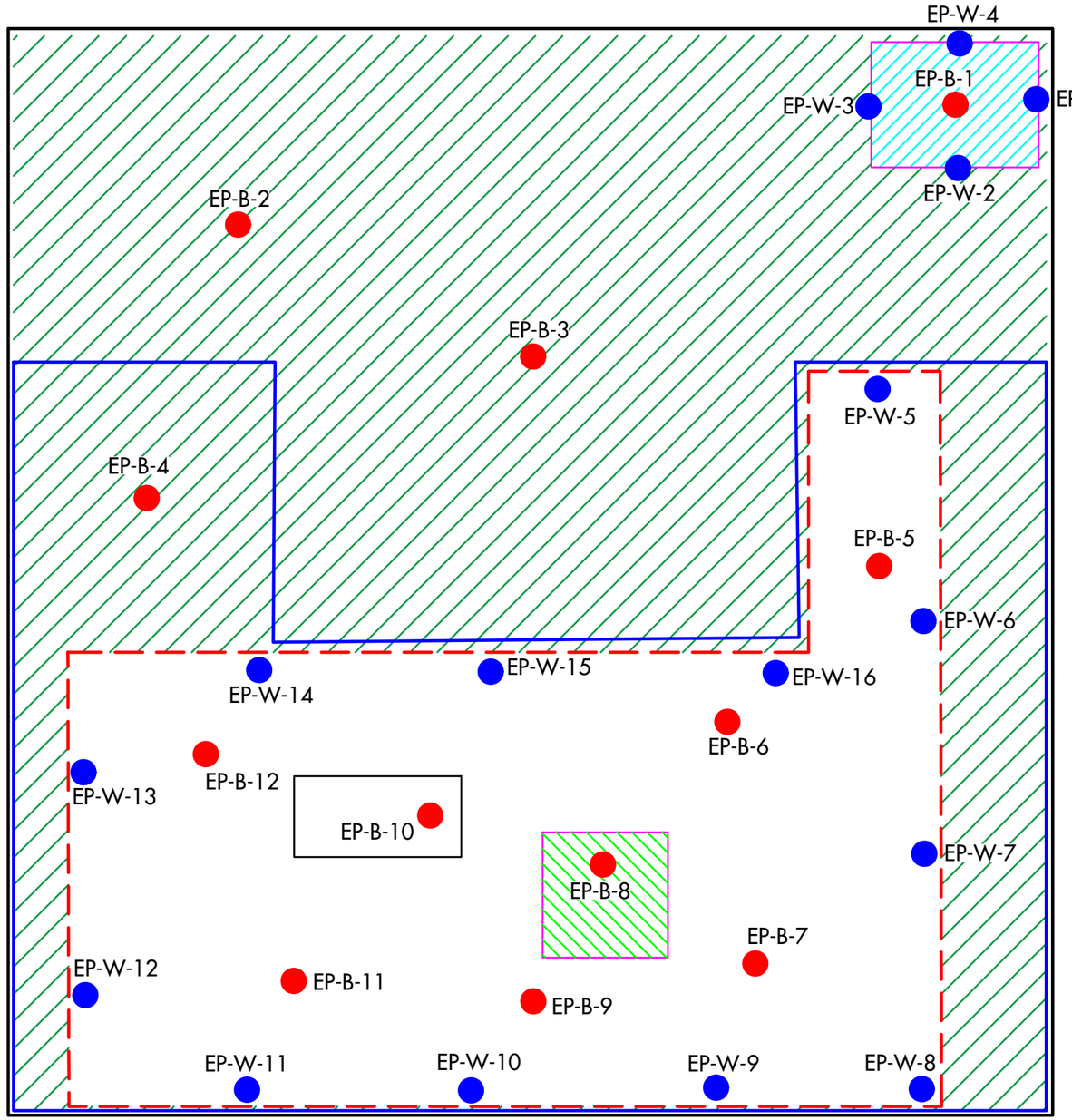
((1)….Analytical Services Protocols (ASP) Deliverables Package Category B.

(2)…If samples are not delivered to the lab with 48 hours after collection, the 40 ml DI Water vials should be preserved in a frozen condition following sampling

Table 2: Sampling & Analytical Method Requirements For Groundwater Samples

Groundwater [1]	Parameters	Minimum Sample Volume	Sample Container	Sample Preservation	Analytical Method	Lab Reporting Limit	Technical Holding Time
Sample ID							
3 Groundwater Sample MW-4a/ MW-5a/ MW-7 & 1 Matrix Spike / 1 Matrix Spike Duplicate &	TCL VOCs	120 ml	40 ml VOC vial with Teflon lined cap	11:1 HCL to pH<2 Cool to 4 °C 4 °C	EPA Method 8260	Compound Specific (0.2-10 µg/L)	14 days
1 Trip Blank/Per Shipment to Laboratory	TCL VOCs	80 ml	40 ml VOC vial with Teflon lined cap	1:1 HCL to pH<2 Cool to 4 °C	EPA Method 8260	Compound Specific (0.5-20 µg/L)	14 days

[(1)]….Analytical Services Protocols (ASP) Deliverables Package Category B.



WEBSTER AVENUE

LEGEND:

- PROPERTY BOUNDARY
- BUILDING OUTLINE
- PARTIAL BASEMENT LAYOUT
- HOTSPOT OF VOCs EXCEEDING PGWSCOs
- HOTSPOT OF SVOCs AND METALS EXCEEDING RRSCOs
- ELEVATOR PIT
- SIDEWALL END-POINT SAMPLE (EP-W-)
- BOTTOM END-POINT SAMPLE (EP-B-)

RRSCO - NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES- RESTRICTED RESIDENTIAL

PGWSCO - NYSDEC PART 375 RESTRICTED USE SOIL CLEANUP OBJECTIVES- PROTECTION OF GROUNDWATER

0 — 30

APPROXIMATE SCALE IN FEET

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HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

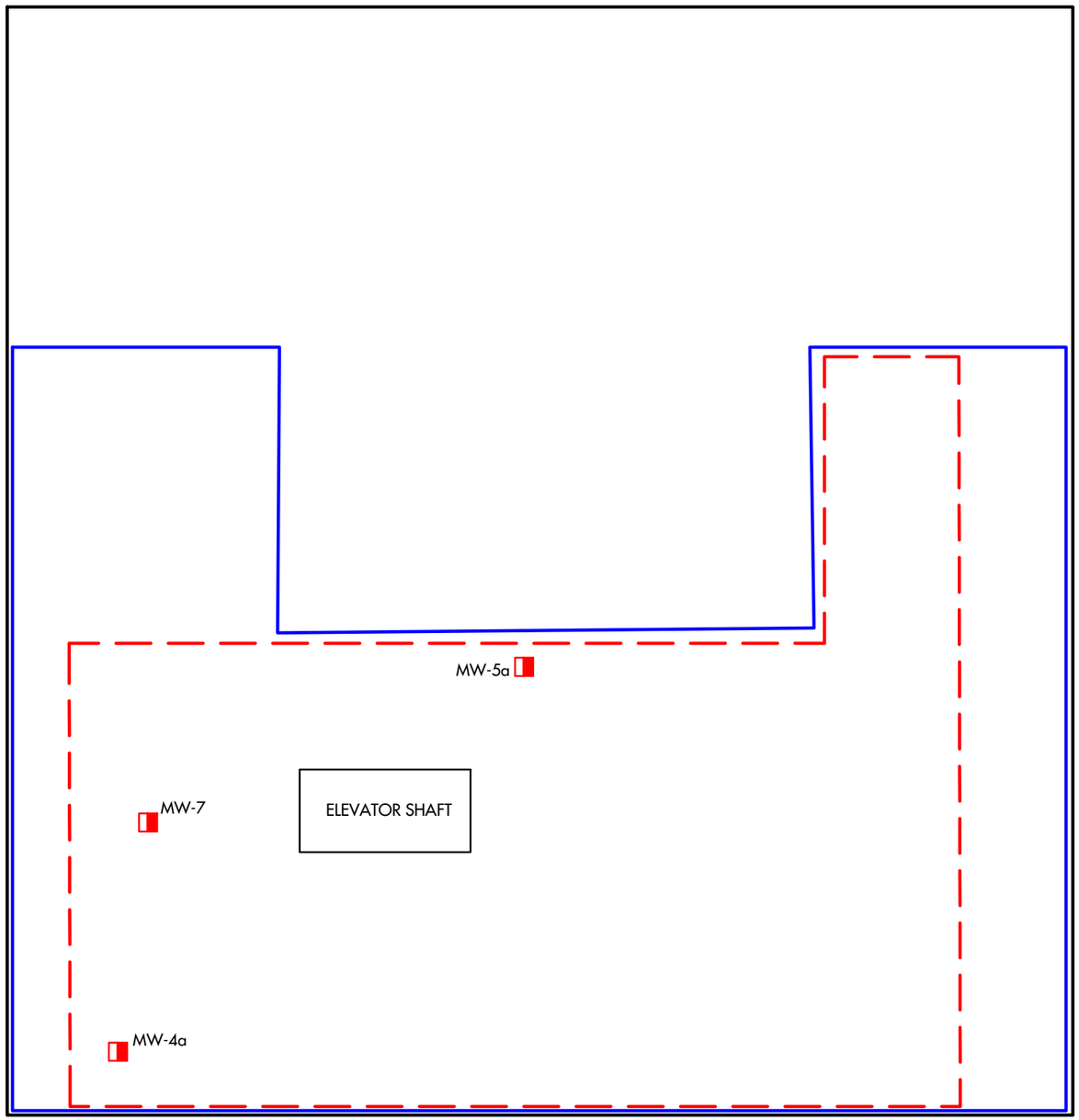
PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 1: PROPOSED POST EXCAVATION END-POINT SOIL SAMPLING PLAN

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.



N

LEGEND:
- PROPERTY BOUNDARY
- BUILDING OUTLINE
- PARTIAL BASEMENT LAYOUT
- MONITORING WELL (MW-)

0 30
APPROXIMATE SCALE IN FEET

WEBSTER AVENUE

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HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

PROJECT NAME AND ADDRESS

3038 WEBSTER AVENUE, BRONX, NY.

PROJECT FIGURE

FIGURE 2: PROPOSED POST REMEDIATION GROUNDWATER SAMPLING PLAN

PROJECT NO.	DATE
240040	05/29/26
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS SHOWN	APPROVED BY P.M.

ATTACHMENT A

LOW LOW SAMPLING PROTOCOL AND MONITORING

WELL PURGE/SAMPLING PLAN

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I

LOW STRESS (low flow) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUNDWATER SAMPLES FROM MONITORING WELLS

Quality Assurance Unit
U.S. Environmental Protection Agency – Region 1
11 Technology Drive
North Chelmsford, MA 01863

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Prepared by:_____ _____
(Robert Reinhart, Quality Assurance Unit) Date

Approved by:_____ _____
(John Smaldone, Quality Assurance Unit) Date

Revision Page

Date	Rev #	Summary of changes	Sections
7/30/96	1	Finalized	
01/19/10	2	Updated	All sections
3/23/17	3	Updated	All sections
9/20/17	4	Updated	Section 7.0

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1.0 USE OF TERMS

Equipment blank: The equipment blank shall include the pump and the pump's tubing. If tubing is dedicated to the well, the equipment blank needs only to include the pump in subsequent sampling rounds. If the pump and tubing are dedicated to the well, the equipment blank is collected prior to its placement in the well. If the pump and tubing will be used to sample multiple wells, the equipment blank is normally collected after sampling from contaminated wells and not after background wells.

Field duplicates: Field duplicates are collected to determine precision of the sampling procedure. For this procedure, collect duplicate for each analyte group in consecutive order (VOC original, VOC duplicate, SVOC original, SVOC duplicate, etc.).

Indicator field parameters: This SOP uses field measurements of turbidity, dissolved oxygen, specific conductance, temperature, pH, and oxidation/reduction potential (ORP) as indicators of when purging operations are sufficient and sample collection may begin.

Matrix Spike/Matrix Spike Duplicates: Used by the laboratory in its quality assurance program. Consult the laboratory for the sample volume to be collected.

Potentiometric Surface: The level to which water rises in a tightly cased well constructed in a confined aquifer. In an unconfined aquifer, the potentiometric surface is the water table.

QAPP: Quality Assurance Project Plan

SAP: Sampling and Analysis Plan

SOP: Standard operating procedure

Stabilization: A condition that is achieved when all indicator field parameter measurements are sufficiently stable (as described in the "Monitoring Indicator Field Parameters" section) to allow sample collection to begin.

Temperature blank: A temperature blank is added to each sample cooler. The blank is measured upon receipt at the laboratory to assess whether the samples were properly cooled during transit.

Trip blank (VOCs): Trip blank is a sample of analyte-free water taken to the sampling site and returned to the laboratory. The trip blanks (one pair) are added to each sample cooler that contains VOC samples.

2.0 SCOPE & APPLICATION

The goal of this groundwater sampling procedure is to collect water samples that reflect the total mobile organic and inorganic loads (dissolved and colloidal sized fractions) transported through the subsurface under ambient flow conditions, with minimal physical and chemical alterations from sampling operations. This standard operating procedure (SOP) for collecting groundwater samples will help ensure that the project's data quality objectives (DQOs) are met under certain low-flow conditions.

The SOP emphasizes the need to minimize hydraulic stress at the well-aquifer interface by maintaining low water-level drawdowns, and by using low pumping rates during purging and sampling operations. Indicator field parameters (e.g., dissolved oxygen, pH, etc.) are monitored during purging in order to determine when sample collection may begin. Samples properly collected using this SOP are suitable for analysis of groundwater contaminants (volatile and semi-volatile organic analytes, dissolved gases, pesticides, PCBs, metals and other inorganics), or naturally occurring analytes. This SOP is based on Puls, and Barcelona (1996).

This procedure is designed for monitoring wells with an inside diameter (1.5-inches or greater) that can accommodate a positive lift pump with a screen length or open interval ten feet or less and with a water level above the top of the screen or open interval (Hereafter, the "screen or open interval" will be referred to only as "screen interval"). This SOP is not applicable to other well-sampling conditions.

While the use of dedicated sampling equipment is not mandatory, dedicated pumps and tubing can reduce sampling costs significantly by streamlining sampling activities and thereby reducing the overall field costs.

The goal of this procedure is to emphasize the need for consistency in deploying and operating equipment while purging and sampling monitoring wells during each sampling event. This will help to minimize sampling variability.

This procedure describes a general framework for groundwater sampling. Other site specific information (hydrogeological context, conceptual site model (CSM), DQOs, etc.) coupled with systematic planning must be added to the procedure in order to develop an appropriate site specific SAP/QAPP. In addition, the site specific SAP/QAPP must identify the specific equipment that will be used to collect the groundwater samples.

This procedure does not address the collection of water or free product samples from wells containing free phase LNAPLs and/or DNAPLs (light or dense non-aqueous phase

liquids). For this type of situation, the reader may wish to check: Cohen, and Mercer (1993) or other pertinent documents.

This SOP is to be used when collecting groundwater samples from monitoring wells at all Superfund, Federal Facility and RCRA sites in Region 1 under the conditions described herein. Request for modification of this SOP, in order to better address specific situations at individual wells, must include adequate technical justification for proposed changes. All changes and modifications must be approved and included in a revised SAP/QAPP before implementation in field.

3.0 BACKGROUND FOR IMPLEMENTATION

It is expected that the monitoring well screen has been properly located (both laterally and vertically) to intercept existing contaminant plume(s) or along flow paths of potential contaminant migration. Problems with inappropriate monitoring well placement or faulty/improper well installation cannot be overcome by even the best water sampling procedures. This SOP presumes that the analytes of interest are moving (or will potentially move) primarily through the more permeable zones intercepted by the screen interval.

Proper well construction, development, and operation and maintenance cannot be overemphasized. The use of installation techniques that are appropriate to the hydrogeologic setting of the site often prevent "problem well" situations from occurring. During well development, or redevelopment, tests should be conducted to determine the hydraulic characteristics of the monitoring well. The data can then be used to set the purging/sampling rate, and provide a baseline for evaluating changes in well performance and the potential need for well rehabilitation. Note: if this installation data or well history (construction and sampling) is not available or discoverable, for all wells to be sampled, efforts to build a sampling history should commence with the next sampling event.

The pump intake should be located within the screen interval and at a depth that will remain under water at all times. It is recommended that the intake depth and pumping rate remain the same for all sampling events. The mid-point or the lowest historical midpoint of the saturated screen length is often used as the location of the pump intake. For new wells, or for wells without pump intake depth information, the site's SAP/QAPP must provide clear reasons and instructions on how the pump intake depth(s) will be selected, and reason(s) for the depth(s) selected. If the depths to top and bottom of the well screen are not known, the SAP/QAPP will need to describe how the sampling depth will be determined and how the data can be used.

Stabilization of indicator field parameters is used to indicate that conditions are suitable for sampling to begin. Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. Sample collection

may still take place provided the indicator field parameter criteria in this procedure are met. If after 2 hours of purging indicator field parameters have not stabilized, one of three optional courses of action may be taken: a) continue purging until stabilization is achieved, b) discontinue purging, do not collect any samples, and record in log book that stabilization could not be achieved (documentation must describe attempts to achieve stabilization), c) discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization (note: there is a risk that the analytical data obtained, especially metals and strongly hydrophobic organic analytes, may reflect a sampling bias and therefore, the data may not meet the data quality objectives of the sampling event).

It is recommended that low-flow sampling be conducted when the air temperature is above 32°F (0°C). If the procedure is used below 32°F, special precautions will need to be taken to prevent the groundwater from freezing in the equipment. Because sampling during freezing temperatures may adversely impact the data quality objectives, the need for water sample collection during months when these conditions are likely to occur should be evaluated during site planning and special sampling measures may need to be developed. Ice formation in the flow-through-cell will cause the monitoring probes to act erratically. A transparent flow-through-cell needs to be used to observe if ice is forming in the cell. If ice starts to form on the other pieces of the sampling equipment, additional problems may occur.

4.0 HEALTH & SAFETY

When working on-site, comply with all applicable OSHA requirements and the site's health/safety procedures. All proper personal protection clothing and equipment are to be worn. Some samples may contain biological and chemical hazards. These samples should be handled with suitable protection to skin, eyes, etc.

5.0 CAUTIONS

The following cautions need to be considered when planning to collect groundwater samples when the below conditions occur.

If the groundwater degasses during purging of the monitoring well, dissolved gases and VOCs will be lost. When this happens, the groundwater data for dissolved gases (e.g., methane, ethene, ethane, dissolved oxygen, etc.) and VOCs will need to be qualified. Some conditions that can promote degassing are the use of a vacuum pump (e.g., peristaltic pumps), changes in aperture along the sampling tubing, and squeezing/pinching the pump's tubing which results in a pressure change.

When collecting the samples for dissolved gases and VOCs analyses, avoid aerating the groundwater in the pump's tubing. This can cause loss of the dissolved gases and VOCs in

the groundwater. Having the pump's tubing completely filled prior to sampling will avoid this problem when using a centrifugal pump or peristaltic pump.

Direct sun light and hot ambient air temperatures may cause the groundwater in the tubing and flow-through-cell to heat up. This may cause the groundwater to degas which will result in loss of VOCs and dissolved gases. When sampling under these conditions, the sampler will need to shade the equipment from the sunlight (e.g., umbrella, tent, etc.). If possible, sampling on hot days, or during the hottest time of the day, should be avoided. The tubing exiting the monitoring well should be kept as short as possible to avoid the sun light or ambient air from heating up the groundwater.

Thermal currents in the monitoring well may cause vertical mixing of water in the well bore. When the air temperature is colder than the groundwater temperature, it can cool the top of the water column. Colder water which is denser than warm water sinks to the bottom of the well and the warmer water at the bottom of the well rises, setting up a convection cell. "During low-flow sampling, the pumped water may be a mixture of convecting water from within the well casing and aquifer water moving inward through the screen. This mixing of water during low-flow sampling can substantially increase equilibration times, can cause false stabilization of indicator parameters, can give false indication of redox state, and can provide biological data that are not representative of the aquifer conditions" (Vroblesky 2007).

Failure to calibrate or perform proper maintenance on the sampling equipment and measurement instruments (e.g., dissolved oxygen meter, etc.) can result in faulty data being collected.

Interferences may result from using contaminated equipment, cleaning materials, sample containers, or uncontrolled ambient/surrounding air conditions (e.g., truck/vehicle exhaust nearby).

Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment and/or proper planning to avoid ambient air interferences. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

Clean and decontaminate all sampling equipment prior to use. All sampling equipment needs to be routinely checked to be free from contaminants and equipment blanks collected to ensure that the equipment is free of contaminants. Check the previous equipment blank data for the site (if they exist) to determine if the previous cleaning procedure removed the contaminants. If contaminants were detected and they are a concern, then a more vigorous cleaning procedure will be needed.

6.0 PERSONNEL QUALIFICATIONS

All field samplers working at sites containing hazardous waste must meet the requirements of the OSHA regulations. OSHA regulations may require the sampler to take the 40 hour OSHA health and safety training course and a refresher course prior to engaging in any field activities, depending upon the site and field conditions.

The field samplers must be trained prior to the use of the sampling equipment, field instruments, and procedures. Training is to be conducted by an experienced sampler before initiating any sampling procedure.

The entire sampling team needs to read, and be familiar with, the site Health and Safety Plan, all relevant SOPs, and SAP/QAPP (and the most recent amendments) before going onsite for the sampling event. It is recommended that the field sampling leader attest to the understanding of these site documents and that it is recorded.

7.0 EQUIPMENT AND SUPPLIES

A. Informational materials for sampling event

A copy of the current Health and Safety Plan, SAP/QAPP, monitoring well construction data, location map(s), field data from last sampling event, manuals for sampling, and the monitoring instruments' operation, maintenance, and calibration manuals should be brought to the site.

B. Well keys.

C. Extraction device

Adjustable rate, submersible pumps (e.g., centrifugal, bladder, etc.) which are constructed of stainless steel or polytetrafluoroethylene (PTFE, i.e. Teflon®) are preferred. PTFE, however, should not be used when sampling for per- and polyfluoroalkyl substances (PFAS) as it is likely to contain these substances.

Note: If extraction devices constructed of other materials are to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

If bladder pumps are selected for the collection of VOCs and dissolved gases, the pump setting should be set so that one pulse will deliver a water volume that is sufficient to fill a 40 mL VOC vial. This is not mandatory, but is considered a "best practice". For the proper operation, the bladder pump will need a minimum amount of water above the pump; consult the manufacturer for the recommended submergence. The pump's recommended submergence value should be determined during the planning stage, since it may influence well construction and placement of dedicated pumps where water-level fluctuations are significant.

Adjustable rate, peristaltic pumps (suction) are to be used with caution when collecting samples for VOCs and dissolved gases (e.g., methane, carbon dioxide, etc.) analyses. Additional information on the use of peristaltic pumps can be found in Appendix A. If peristaltic pumps are used, the inside diameter of the rotor head tubing needs to match the inside diameter of the tubing installed in the monitoring well.

Inertial pumping devices (motor driven or manual) are not recommended. These devices frequently cause greater disturbance during purging and sampling, and are less easily controlled than submersible pumps (potentially increasing turbidity and sampling variability, etc.). This can lead to sampling results that are adversely affected by purging and sampling operations, and a higher degree of data variability.

D. Tubing

PTFE (Teflon®) or PTFE-lined polyethylene tubing are preferred when sampling is to include VOCs, SVOCs, pesticides, PCBs and inorganics. As discussed in the previous section, PTFE tubing should not be used when sampling for PFAS. In this case, a suitable alternative such as high-density polyethylene tubing should be used.

PVC, polypropylene or polyethylene tubing may be used when collecting samples for metal and other inorganics analyses.

Note: If tubing constructed of other materials is to be used, adequate information must be provided to show that the substituted materials do not leach contaminants nor cause interferences to the analytical procedures to be used. Acceptance of these materials must be obtained before the sampling event.

The use of 1/4 inch or 3/8 inch (inside diameter) tubing is recommended. This will help ensure that the tubing remains liquid filled when operating at very low pumping rates when using centrifugal and peristaltic pumps.

Silastic tubing should be used for the section around the rotor head of a peristaltic pump. It should be less than a foot in length. The inside diameter of the tubing used at the pump rotor head must be the same as the inside diameter of tubing placed in the well. A tubing connector is used to connect the pump rotor head tubing to the well tubing. Alternatively, the two pieces of tubing can be connected to each other by placing the one end of the tubing inside the end of the other tubing. The tubing must not be reused.

E. The water level measuring device

Electronic ”tape”, pressure transducer, water level sounder/level indicator, etc. should be capable of measuring to 0.01 foot accuracy. Recording pressure transducers, mounted above the pump, are especially helpful in tracking water levels during pumping operations, but their use must include check measurements with a water level “tape” at the start and end of each sampling event.

F. Flow measurement supplies

Graduated cylinder (size according to flow rate) and stopwatch usually will suffice.

Large graduated bucket used to record total water purged from the well.

G. Interface probe

To be used to check on the presence of free phase liquids (LNAPL, or DNAPL) before purging begins (as needed).

H. Power source (generator, nitrogen tank, battery, etc.)

When a gasoline generator is used, locate it downwind and at least 30 feet from the well so that the exhaust fumes do not contaminate samples.

I. Indicator field parameter monitoring instruments

Use of a multi-parameter instrument capable of measuring pH, oxidation/reduction potential (ORP), dissolved oxygen (DO), specific conductance, temperature, and coupled with a flow-through-cell is required when measuring all indicator field parameters, except turbidity. Turbidity is collected using a separate instrument. Record equipment/instrument identification (manufacturer, and model number).

Transparent, small volume flow-through-cells (e.g., 250 mLs or less) are preferred. This allows observation of air bubbles and sediment buildup in the cell, which can interfere with the operation of the monitoring instrument probes, to be easily detected. A small volume

cell facilitates rapid turnover of water in the cell between measurements of the indicator field parameters.

It is recommended to use a flow-through-cell and monitoring probes from the same manufacturer and model to avoid incompatibility between the probes and flow-through-cell.

Turbidity samples are collected before the flow-through-cell. A "T" connector coupled with a valve is connected between the pump's tubing and flow-through-cell. When a turbidity measurement is required, the valve is opened to allow the groundwater to flow into a container. The valve is closed and the container sample is then placed in the turbidimeter.

Standards are necessary to perform field calibration of instruments. A minimum of two standards are needed to bracket the instrument measurement range for all parameters except ORP which use a Zobell solution as a standard. For dissolved oxygen, a wet sponge used for the 100% saturation and a zero dissolved oxygen solution are used for the calibration.

Barometer (used in the calibration of the Dissolved Oxygen probe) and the conversion formula to convert the barometric pressure into the units of measure used by the Dissolved Oxygen meter are needed.

J. Decontamination supplies

Includes (for example) non-phosphate detergent, distilled/deionized water, isopropyl alcohol, etc.

K. Record keeping supplies

Logbook(s), well purging forms, chain-of-custody forms, field instrument calibration forms, etc.

L. Sample bottles

M. Sample preservation supplies (as required by the analytical methods)

N. Sample tags or labels

O. PID or FID instrument

If appropriate, to detect VOCs for health and safety purposes, and provide qualitative field evaluations.

P. Miscellaneous Equipment

Equipment to keep the sampling apparatus shaded in the summer (e.g., umbrella) and from freezing in the winter. If the pump's tubing is allowed to heat up in the warm weather, the cold groundwater may degas as it is warmed in the tubing.

8.0 EQUIPMENT/INSTRUMENT CALIBRATION

Prior to the sampling event, perform maintenance checks on the equipment and instruments according to the manufacturer's manual and/or applicable SOP. This will ensure that the equipment/instruments are working properly before they are used in the field.

Prior to sampling, the monitoring instruments must be calibrated and the calibration documented. The instruments are calibrated using U.S Environmental Protection Agency Region 1 *Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction [ORP], and turbidity),* March 23, 2017, or latest version or from one of the methods listed in 40CFR136, 40CFR141 and SW-846.

The instruments shall be calibrated at the beginning of each day. If the field measurement falls outside the calibration range, the instrument must be re-calibrated so that all measurements fall within the calibration range. At the end of each day, a calibration check is performed to verify that instruments remained in calibration throughout the day. This check is performed while the instrument is in measurement mode, not calibration mode. If the field instruments are being used to monitor the natural attenuation parameters, then a calibration check at mid-day is highly recommended to ensure that the instruments did not drift out of calibration. Note: during the day if the instrument reads zero or a negative number for dissolved oxygen, pH, specific conductance, or turbidity (negative value only), this indicates that the instrument drifted out of calibration or the instrument is malfunctioning. If this situation occurs the data from this instrument will need to be qualified or rejected.

9.0 PRELIMINARY SITE ACTIVITIES (as applicable)

Check the well for security (damage, evidence of tampering, missing lock, etc.) and record pertinent observations (include photograph as warranted).

If needed, lay out a sheet of clean polyethylene for monitoring and sampling equipment, unless equipment is elevated above the ground (e.g., on a table, etc.).

Remove well cap and if appropriate measure VOCs at the rim of the well with a PID or FID instrument and record reading in field logbook or on the well purge form.

If the well casing does not have an established reference point (usually a V-cut or indelible mark in the well casing), make one. Describe its location and record the date of the mark in the logbook (consider a photographic record as well). All water level measurements must be recorded relative to this reference point (and the altitude of this point should be determined using techniques that are appropriate to site's DQOs.

If water-table or potentiometric surface map(s) are to be constructed for the sampling event, perform synoptic water level measurement round (in the shortest possible time) before any purging and sampling activities begin. If possible, measure water level depth (to 0.01 ft.) and total well depth (to 0.1 ft.) the day before sampling begins, in order to allow for re-settlement of any particulates in the water column. This is especially important for those wells that have not been recently sampled because sediment buildup in the well may require the well to be redeveloped. If measurement of total well depth is not made the day before, it should be measured after sampling of the well is complete. All measurements must be taken from the established referenced point. Care should be taken to minimize water column disturbance.

Check newly constructed wells for the presence of LNAPLs or DNAPLs before the initial sampling round. If none are encountered, subsequent check measurements with an interface probe may not be necessary unless analytical data or field analysis signal a worsening situation. This SOP cannot be used in the presence of LNAPLs or DNAPLs. If NAPLs are present, the project team must decide upon an alternate sampling method. All project modifications must be approved and documented prior to implementation.

If available check intake depth and drawdown information from previous sampling event(s) for each well. Duplicate, to the extent practicable, the intake depth and extraction rate (use final pump dial setting information) from previous event(s). If changes are made in the intake depth or extraction rate(s) used during previous sampling event(s), for either portable or dedicated extraction devices, record new values, and explain reasons for the changes in the field logbook.

10.0 PURGING AND SAMPLING PROCEDURE

Purging and sampling wells in order of increasing chemical concentrations (known or anticipated) are preferred.

The use of dedicated pumps is recommended to minimize artificial mobilization and entrainment of particulates each time the well is sampled. Note that the use of dedicated sampling equipment can also significantly reduce the time needed to complete each sampling event, will promote consistency in the sampling, and may reduce sampling bias by having the pump's intake at a constant depth.

A. Initial Water Level

Measure the water level in the well before installing the pump if a non-dedicated pump is being used. The initial water level is recorded on the purge form or in the field logbook.

B. Install Pump

Lower pump, safety cable, tubing and electrical lines slowly (to minimize disturbance) into the well to the appropriate depth (may not be the mid-point of the screen/open interval). The Sampling and Analysis Plan/Quality Assurance Project Plan should specify the sampling depth (used previously), or provide criteria for selection of intake depth for each new well. If possible keep the pump intake at least two feet above the bottom of the well, to minimize mobilization of particulates present in the bottom of the well.

Pump tubing lengths, above the top of well casing should be kept as short as possible to minimize heating the groundwater in the tubing by exposure to sun light and ambient air temperatures. Heating may cause the groundwater to degas, which is unacceptable for the collection of samples for VOC and dissolved gases analyses.

C. Measure Water Level

Before starting pump, measure water level. Install recording pressure transducer, if used to track drawdowns, to initialize starting condition.

D. Purge Well

From the time the pump starts purging and until the time the samples are collected, the purged water is discharged into a graduated bucket to determine the total volume of groundwater purged. This information is recorded on the purge form or in the field logbook.

Start the pump at low speed and slowly increase the speed until discharge occurs. Check water level. Check equipment for water leaks and if present fix or replace the affected equipment. Try to match pumping rate used during previous sampling event(s). Otherwise, adjust pump speed until there is little or no water level drawdown. If the

minimal drawdown that can be achieved exceeds 0.3 feet, but remains stable, continue purging.

Monitor and record the water level and pumping rate every five minutes (or as appropriate) during purging. Record any pumping rate adjustments (both time and flow rate). Pumping rates should, as needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. During pump start-up, drawdown may exceed the 0.3 feet target and then "recover" somewhat as pump flow adjustments are made. Purge volume calculations should utilize stabilized drawdown value, not the initial drawdown. If the initial water level is above the top of the screen do not allow the water level to fall into the well screen. The final purge volume must be greater than the stabilized drawdown volume plus the pump's tubing volume. If the drawdown has exceeded 0.3 feet and stabilizes, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are collected.

Avoid the use of constriction devices on the tubing to decrease the flow rate because the constrictor will cause a pressure difference in the water column. This will cause the groundwater to degas and result in a loss of VOCs and dissolved gasses in the groundwater samples.

Note: the flow rate used to achieve a stable pumping level should remain constant while monitoring the indicator parameters for stabilization and while collecting the samples.

Wells with low recharge rates may require the use of special pumps capable of attaining very low pumping rates (e.g., bladder, peristaltic), and/or the use of dedicated equipment. For new monitoring wells, or wells where the following situation has not occurred before, if the recovery rate to the well is less than 50 mL/min., or the well is being essentially dewatered during purging, the well should be sampled as soon as the water level has recovered sufficiently to collect the volume needed for all anticipated samples. The project manager or field team leader will need to make the decision when samples should be collected, how the sample is to be collected, and the reasons recorded on the purge form or in the field logbook. A water level measurement needs to be performed and recorded before samples are collected. If the project manager decides to collect the samples using the pump, it is best during this recovery period that the pump intake tubing not be removed, since this will aggravate any turbidity problems. Samples in this specific situation may be collected without stabilization of indicator field parameters. Note that field conditions and efforts to overcome problematic situations must be recorded in order to support field decisions to deviate from normal procedures described in this SOP. If this type of problematic situation persists in a well, then water sample collection should be

changed to a passive or no-purge method, if consistent with the site's DQOs, or have a new well installed.

E. Monitor Indicator Field Parameters

After the water level has stabilized, connect the "T" connector with a valve and the flow-through-cell to monitor the indicator field parameters. If excessive turbidity is anticipated or encountered with the pump startup, the well may be purged for a while without connecting up the flow-through-cell, in order to minimize particulate buildup in the cell (This is a judgment call made by the sampler). Water level drawdown measurements should be made as usual. If possible, the pump may be installed the day before purging to allow particulates that were disturbed during pump insertion to settle.

During well purging, monitor indicator field parameters (turbidity, temperature, specific conductance, pH, ORP, DO) at a frequency of five minute intervals or greater. The pump's flow rate must be able to "turn over" at least one flow-through-cell volume between measurements (for a 250 mL flow-through-cell with a flow rate of 50 mLs/min., the monitoring frequency would be every five minutes; for a 500 mL flow-through-cell it would be every ten minutes). If the cell volume cannot be replaced in the five minute interval, then the time between measurements must be increased accordingly. Note: during the early phase of purging, emphasis should be put on minimizing and stabilizing pumping stress, and recording those adjustments followed by stabilization of indicator parameters. Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings are within the following limits:

Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

All measurements, except turbidity, must be obtained using a flow-through-cell. Samples for turbidity measurements are obtained before water enters the flow-through-cell. Transparent flow-through-cells are preferred, because they allow field personnel to watch for particulate build-up within the cell. This build-up may affect indicator field parameter values measured within the cell. If the cell needs to be cleaned during purging operations, continue pumping and disconnect cell for cleaning, then reconnect after cleaning and

continue monitoring activities. Record start and stop times and give a brief description of cleaning activities.

The flow-through-cell must be designed in a way that prevents gas bubble entrapment in the cell. Placing the flow-through-cell at a 45 degree angle with the port facing upward can help remove bubbles from the flow-through-cell (see Appendix B Low-Flow Setup Diagram). Throughout the measurement process, the flow-through-cell must remain free of any gas bubbles. Otherwise, the monitoring probes may act erratically. When the pump is turned off or cycling on/off (when using a bladder pump), water in the cell must not drain out. Monitoring probes must remain submerged in water at all times.

F. Collect Water Samples

When samples are collected for laboratory analyses, the pump's tubing is disconnected from the "T" connector with a valve and the flow-through-cell. The samples are collected directly from the pump's tubing. Samples must not be collected from the flow-through-cell or from the "T" connector with a valve.

VOC samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

If the pump's flow rate is too high to collect the VOC/dissolved gases samples, collect the other samples first. Lower the pump's flow rate to a reasonable rate and collect the VOC/dissolved gases samples and record the new flow rate.

During purging and sampling, the centrifugal/peristaltic pump tubing must remain filled with water to avoid aeration of the groundwater. It is recommended that 1/4 inch or 3/8 inch (inside diameter) tubing be used to help ensure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, use the following procedure to collect samples: collect non-VOC/dissolved gases samples first, then increase flow rate slightly until the water completely fills the tubing, collect the VOC/dissolved gases samples, and record new drawdown depth and flow rate.

For bladder pumps that will be used to collect VOC or dissolved gas samples, it is recommended that the pump be set to deliver long pulses of water so that one pulse will fill a 40 mL VOC vial.

Use pre-preserved sample containers or add preservative, as required by analytical methods, to the samples immediately after they are collected. Check the analytical methods

(e.g. EPA SW-846, 40 CFR 136, water supply, etc.) for additional information on preservation.

If determination of filtered metal concentrations is a sampling objective, collect filtered water samples using the same low flow procedures. The use of an in-line filter (transparent housing preferred) is required, and the filter size (0.45 µm is commonly used) should be based on the sampling objective. Pre-rinse the filter with groundwater prior to sample collection. Make sure the filter is free of air bubbles before samples are collected. Preserve the filtered water sample immediately. Note: filtered water samples are not an acceptable substitute for unfiltered samples when the monitoring objective is to obtain chemical concentrations of total mobile contaminants in groundwater for human health or ecological risk calculations.

Label each sample as collected. Samples requiring cooling will be placed into a cooler with ice or refrigerant for delivery to the laboratory. Metal samples after acidification to a pH less than 2 do not need to be cooled.

G. Post Sampling Activities

If a recording pressure transducer is used to track drawdown, re-measure water level with tape.

After collection of samples, the pump tubing may be dedicated to the well for re-sampling (by hanging the tubing inside the well), decontaminated, or properly discarded.

Before securing the well, measure and record the well depth (to 0.1 ft.), if not measured the day before purging began. Note: measurement of total well depth annually is usually sufficient after the initial low stress sampling event. However, a greater frequency may be needed if the well has a “silting” problem or if confirmation of well identity is needed.

Secure the well.

11.0 DECONTAMINATION

Decontaminate sampling equipment prior to use in the first well, and then following sampling of each subsequent well. Pumps should not be removed between purging and sampling operations. The pump, tubing, support cable and electrical wires which were in contact with the well should be decontaminated by one of the procedures listed below.

The use of dedicated pumps and tubing will reduce the amount of time spent on decontamination of the equipment. If dedicated pumps and tubing are used, only the initial sampling event will require decontamination of the pump and tubing.

Note if the previous equipment blank data showed that contaminant(s) were present after using the below procedure or the one described in the SAP/QAPP, a more vigorous procedure may be needed.

Procedure 1

Decontaminating solutions can be pumped from either buckets or short PVC casing sections through the pump and tubing. The pump may be disassembled and flushed with the decontaminating solutions. It is recommended that detergent and alcohol be used sparingly in the decontamination process and water flushing steps be extended to ensure that any sediment trapped in the pump is removed. The pump exterior and electrical wires must be rinsed with the decontaminating solutions, as well. The procedure is as follows:

Flush the equipment/pump with potable water.

Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.

Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

Optional - flush with isopropyl alcohol (pesticide grade; must be free of ketones {e.g., acetone}) or with methanol. This step may be required if the well is highly contaminated or if the equipment blank data from the previous sampling event show that the level of contaminants is significant.

Flush with distilled/deionized water. This step must remove all traces of alcohol (if used) from the equipment. The final water rinse must not be recycled.

Procedure 2

Steam clean the outside of the submersible pump.

Pump hot potable water from the steam cleaner through the inside of the pump. This can be accomplished by placing the pump inside a three or four inch diameter PVC pipe with end cap. Hot water from the steam cleaner jet will be directed inside the PVC pipe and the pump exterior will be cleaned. The hot water from the steam cleaner will then be pumped from the PVC pipe through the pump and collected into another container. Note: additives or solutions should not be added to the steam cleaner.

Pump non-phosphate detergent solution through the inside of the pump. If the solution is recycled, the solution must be changed periodically.

Pump potable water through the inside of the pump to remove all of the detergent solution. If the solution is recycled, the solution must be changed periodically.

Pump distilled/deionized water through the pump. The final water rinse must not be recycled.

12.0 FIELD QUALITY CONTROL

Quality control samples are required to verify that the sample collection and handling process has not compromised the quality of the groundwater samples. All field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation. Quality control samples include field duplicates, equipment blanks, matrix spike/matrix spike duplicates, trip blanks (VOCs), and temperature blanks.

13.0 FIELD LOGBOOK

A field log shall be kept to document all groundwater field monitoring activities (see Appendix C, example table), and record the following for each well:

Site name, municipality, state.

Well identifier, latitude-longitude or state grid coordinates.

Measuring point description (e.g., north side of PVC pipe).

Well depth, and measurement technique.

Well screen length.

Pump depth.

Static water level depth, date, time and measurement technique.

Presence and thickness of immiscible liquid (NAPL) layers and detection method.

Pumping rate, drawdown, indicator parameters values, calculated or measured total volume pumped, and clock time of each set of measurements.

Type of tubing used and its length.

Type of pump used.

Clock time of start and end of purging and sampling activity.

Types of sample bottles used and sample identification numbers.

Preservatives used.

Parameters requested for analyses.

Field observations during sampling event.

Name of sample collector(s).

Weather conditions, including approximate ambient air temperature.

QA/QC data for field instruments.

Any problems encountered should be highlighted.

Description of all sampling/monitoring equipment used, including trade names, model number, instrument identification number, diameters, material composition, etc.

14.0 DATA REPORT

Data reports are to include laboratory analytical results, QA/QC information, field indicator parameters measured during purging, field instrument calibration information, and whatever other field logbook information is needed to allow for a full evaluation of data usability.

Note: the use of trade, product, or firm names in this sampling procedure is for descriptive purposes only and does not constitute endorsement by the U.S. EPA.

15.0 REFERENCES

Cohen, R.M. and J.W. Mercer, 1993, *DNAPL Site Evaluation*; C.K. Smoley (CRC Press), Boca Raton, Florida.

Robert W. Puls and Michael J. Barcelona, *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*, April 1996 (EPA/540/S-95/504).

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U.S Environmental Protection Agency, 40 CFR 136.

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Vroblesky, Don A., Clifton C. Casey, and Mark A. Lowery, Summer 2007, Influence of Dissolved Oxygen Convection on Well Sampling, *Ground Water Monitoring & Remediation* 27, no. 3: 49-58.

APPENDIX A

PERISTALTIC PUMPS

Before selecting a peristaltic pump to collect groundwater samples for VOCs and/or dissolved gases, (e.g., methane, carbon dioxide, etc.) consideration should be given to the following:

- The decision of whether or not to use a peristaltic pump is dependent on the intended use of the data.
- If the additional sampling error that may be introduced by this device is NOT of concern for the VOC/dissolved gases data's intended use, then this device may be acceptable.
- If minor differences in the groundwater concentrations could affect the decision, such as to continue or terminate groundwater cleanup or whether the cleanup goals have been reached, then this device should NOT be used for VOC/dissolved gases sampling. In these cases, centrifugal or bladder pumps are a better choice for more accurate results.

EPA and USGS have documented their concerns with the use of the peristaltic pumps to collect water sample in the below documents.

- "Suction Pumps are not recommended because they may cause degassing, pH modification, and loss of volatile compounds" *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001, December 1987.
- "The agency does not recommend the use of peristaltic pumps to sample ground water particularly for volatile organic analytes" *RCRA Ground-Water Monitoring Draft Technical Guidance*, EPA Office of Solid Waste, November 1992.
- "The peristaltic pump is limited to shallow applications and can cause degassing resulting in alteration of pH, alkalinity, and volatiles loss", *Low-flow (Minimal drawdown) Ground-Water Sampling Procedures*, by Robert Puls & Michael Barcelona, April 1996, EPA/540/S-95/504.
- "Suction-lift pumps, such as peristaltic pumps, can operate at a very low pumping rate; however, using negative pressure to lift the sample can result in the loss of volatile analytes", USGS Book 9 Techniques of Water-Resources Investigation, Chapter A4. (Version 2.0, 9/2006).

APPENDIX B

SUMMARY OF SAMPLING INSTRUCTIONS

These instructions are for using an adjustable rate, submersible pump or a peristaltic pump with the pump's intake placed at the midpoint of a 10 foot or less well screen or an open interval. The water level in the monitoring well is above the top of the well screen or open interval, the ambient temperature is above 32°F, and the equipment is not dedicated. Field instruments are already calibrated. The equipment is setup according to the diagram at the end of these instructions.

1. Review well installation information. Record well depth, length of screen or open interval, and depth to top of the well screen. Determine the pump's intake depth (e.g., mid-point of screen/open interval).

2. On the day of sampling, check security of the well casing, perform any safety checks needed for the site, lay out a sheet of polyethylene around the well (if necessary), and setup the equipment. If necessary a canopy or an equivalent item can be setup to shade the pump's tubing and flow-through-cell from the sun light to prevent the sun light from heating the groundwater.

3. Check well casing for a reference mark. If missing, make a reference mark. Measure the water level (initial) to 0.01 ft. and record this information.

4. Install the pump's intake to the appropriate depth (e.g., midpoint) of the well screen or open interval. Do not turn-on the pump at this time.

5. Measure water level and record this information.

6. Turn-on the pump and discharge the groundwater into a graduated waste bucket. Slowly increase the flow rate until the water level starts to drop. Reduce the flow rate slightly so the water level stabilizes. Record the pump's settings. Calculate the flow rate using a graduated container and a stop watch. Record the flow rate. Do not let the water level drop below the top of the well screen.

If the groundwater is highly turbid or discolored, continue to discharge the water into the bucket until the water clears (visual observation); this usually takes a few minutes. The turbid or discolored water is usually from the well-being disturbed during the pump installation. If the water does not clear, then you need to make a choice whether to continue purging the well (hoping that it will clear after a reasonable time) or continue to

the next step. Note, it is sometimes helpful to install the pump the day before the sampling event so that the disturbed materials in the well can settle out.

If the water level drops to the top of the well screen during the purging of the well, stop purging the well, and do the following:

> Wait for the well to recharge to a sufficient volume so samples can be collected. This may take a while (pump may be removed from well, if turbidity is not a problem). The project manager will need to make the decision when samples should be collected and the reasons recorded in the site's log book. A water level measurement needs to be performed and recorded before samples are collected. When samples are being collected, the water level must not drop below the top of the screen or open interval. Collect the samples from the pump's tubing. Always collect the VOCs and dissolved gases samples first. Normally, the samples requiring a small volume are collected before the large volume samples are collected just in case there is not sufficient water in the well to fill all the sample containers. All samples must be collected, preserved, and stored according to the analytical method. Remove the pump from the well and decontaminate the sampling equipment.

If the water level has dropped 0.3 feet or less from the initial water level (water level measure before the pump was installed); proceed to Step 7. If the water level has dropped more than 0.3 feet, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are be collected.

7. Attach the pump's tubing to the "T" connector with a valve (or a three-way stop cock). The pump's tubing from the well casing to the "T" connector must be as short as possible to prevent the groundwater in the tubing from heating up from the sun light or from the ambient air. Attach a short piece of tubing to the other end of the end of the "T" connector to serve as a sampling port for the turbidity samples. Attach the remaining end of the "T" connector to a short piece of tubing and connect the tubing to the flow-through-cell bottom port. To the top port, attach a small piece of tubing to direct the water into a calibrated waste bucket. Fill the cell with the groundwater and remove all gas bubbles from the cell. Position the flow-through-cell in such a way that if gas bubbles enter the cell they can easily exit the cell. If the ports are on the same side of the cell and the cell is cylindrical shape, the cell can be placed at a 45-degree angle with the ports facing upwards; this position should keep any gas bubbles entering the cell away from the monitoring probes and allow the gas bubbles to exit the cell easily (see Low-Flow Setup Diagram). Note:

make sure there are no gas bubbles caught in the probes' protective guard; you may need to shake the cell to remove these bubbles.

8. Turn-on the monitoring probes and turbidity meter.

9. Record the temperature, pH, dissolved oxygen, specific conductance, and oxidation/reduction potential measurements. Open the valve on the "T" connector to collect a sample for the turbidity measurement, close the valve, do the measurement, and record this measurement. Calculate the pump's flow rate from the water exiting the flow-through-cell using a graduated container and a stop watch, and record the measurement. Measure and record the water level. Check flow-through-cell for gas bubbles and sediment; if present, remove them.

10. Repeat Step 9 every 5 minutes or as appropriate until monitoring parameters stabilized. Note: at least one flow-through-cell volume must be exchanged between readings. If not, the time interval between readings will need to be increased. Stabilization is achieved when three consecutive measurements are within the following limits:

Turbidity (10% for values greater than 5 NTUs; if three Turbidity values are less than 5 NTUs, consider the values as stabilized),
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

If these stabilization requirements do not stabilize in a reasonable time, the probes may have been coated from the materials in the groundwater, from a buildup of sediment in the flow-through-cell, or a gas bubble is lodged in the probe. The cell and the probes will need to be cleaned. Turn-off the probes (not the pump), disconnect the cell from the "T" connector and continue to purge the well. Disassemble the cell, remove the sediment, and clean the probes according to the manufacturer's instructions. Reassemble the cell and connect the cell to the "T" connector. Remove all gas bubbles from the cell, turn-on the probes, and continue the measurements. Record the time the cell was cleaned.

11. When it is time to collect the groundwater samples, turn-off the monitoring probes, and disconnect the pump's tubing from the "T" connector. If you are using a centrifugal or peristaltic pump check the pump's tubing to determine if the tubing is completely filled with water (no air space).

All samples must be collected and preserved according to the analytical method. VOCs and dissolved gases samples are normally collected first and directly into pre-preserved sample containers. However, this may not be the case for all sampling locations; the SAP/QAPP should list the order in which the samples are to be collected based on the project's objective(s). Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

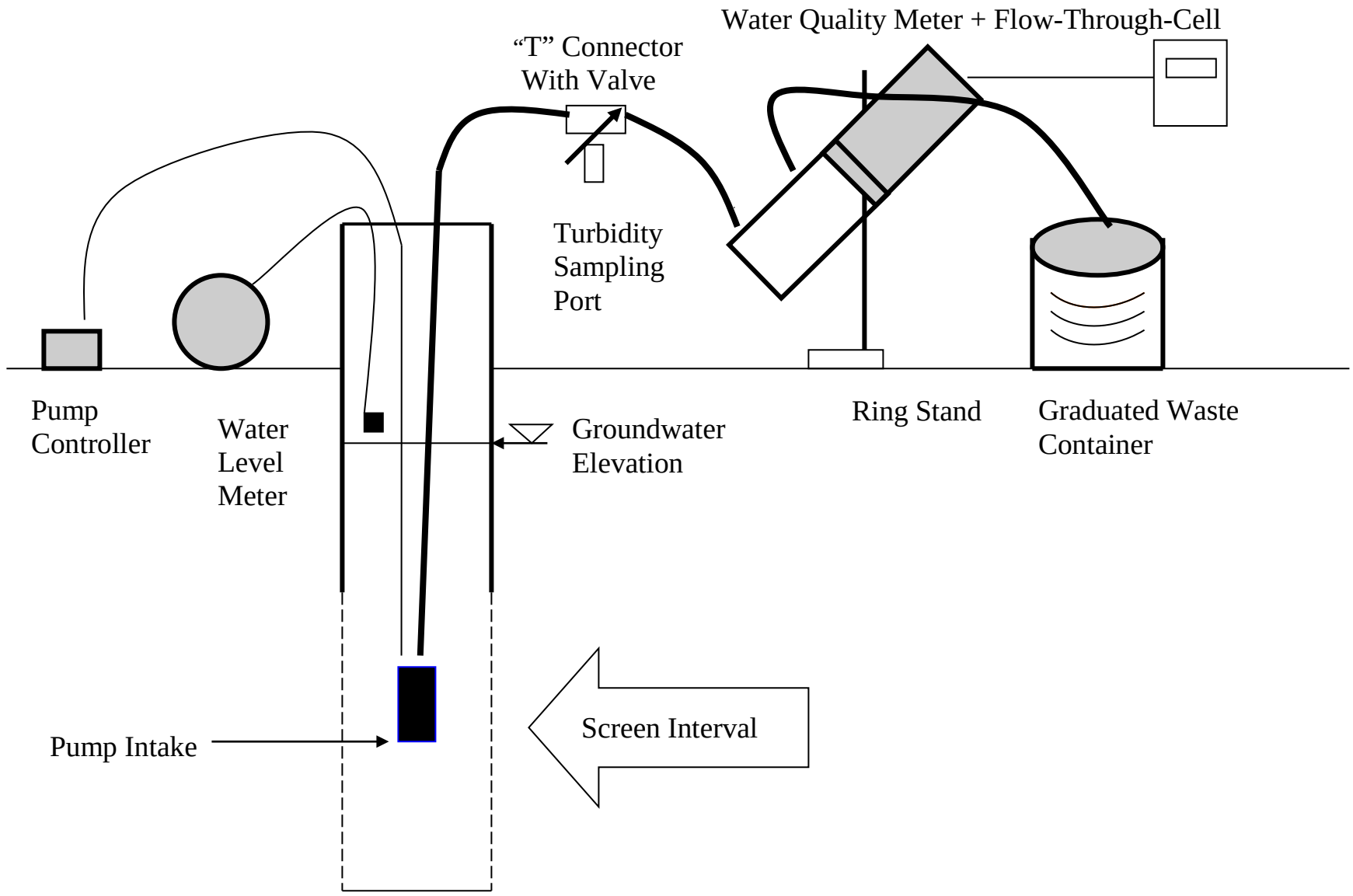
If the pump's tubing is not completely filled with water and the samples are being collected for VOCs and/or dissolved gases analyses using a centrifugal or peristaltic pump, do the following:

> All samples must be collected and preserved according to the analytical method. The VOCs and the dissolved gases (e.g., methane, ethane, ethene, and carbon dioxide) samples are collected last. When it becomes time to collect these samples increase the pump's flow rate until the tubing is completely filled. Collect the samples and record the new flow rate.

12. Store the samples according to the analytical method.

13. Record the total purged volume (graduated waste bucket). Remove the pump from the well and decontaminate the sampling equipment.

Low-Flow Setup Diagram



APPENDIX C

EXAMPLE (Minimum Requirements)

WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name)_____ Depth to _____/_____ of screen
Well Number_____ Date_____ (below MP) top bottom
Field Personnel_____ Pump Intake at (ft. below MP)_____
Sampling Organization_____ Purging Device; (pump type)_____
Identify MP_____ Total Volume Purged _____

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged liters	Temp. "C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Tur-bidity NTU	Comments
Stabilization Criteria					3%	3%	±0.1	±10 mv	10%	10%	

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (ORP)

Monitoring Well Sampling Log Sheet

Job No.: _____ **Well No.:** _____ **Date:** __/__/__

Well Depth: _____ **Screen Length:** _____ **Well Diameter:** _____ **Casing Type:** _____

Sampling Device: _____ **Tubing Type:** _____ **Initial DTP:** _____ **Initial DTW:** _____

Well Volume: _____ **Total Volume Purged:** _____

Sampling Personnel:_____

Low Flow Sampling required ? Yes : _____ No: _____ pumping rate less than 0.5 L /minute

Deviation			±0.1	± 3%	± 3%	10%*	± 10%**	± 10 mv	Stabilization over 3 consecutive readings
Time	**DTP (ft)**	**DTW (ft)**	**pH**	**Temp (ºF)**	**Cond. (mS/Cm)**	**Dis.O2 (mg/L)**	**Turb.(NTU)**	**ORP (mV)**	**Purged water volume**

Notes

* Dissolved Oxygen (10% for values exceeding 5 mg/L or considered stabilized if less than 5 mg/L),

** Turbidity (10% for values exceeding 5 NTU or considered stabilized if less than 5 NTU).

ATTACHMENT B

RESUMES OF KEY PERSONNEL INVOLVED IN THIS PROJECT

TAREK Z. KHOURI, P.E. *Principal Environmental Engineer*

Education

M.S. Environmental Engineering, University of Central Florida

B.S. Chemistry, University of Central Florida

Professional Registration

Professional Engineer (P.E.)
Connecticut # 0031583
D.C. # 908711
Maryland # 49155
Massachusetts # 52601
New Jersey # 24GE04697200
New York # 086611
Pennsylvania # PE084919
Rhode Island # 12059
Texas # 125442
Virginia # 0402056415

Certifications

OSHA: 40 Hour HAZWOPER; 8 Hour Supervisor Management; 10 Hour Construction Safety

USACE Construction Quality Management

Affiliations

Transportation & Infrastructure Committee, NY Building Congress (NYBC), NY, USA

Environmental and Energy Committee, American Society of Engineering Companies (ACEC) NY, USA

Chairman (2013), Solid Waste Committee, Qatar Green Building Council (QGBC) Qatar

Legislative Committee (2008-2010), National Brownfield Association (NBA), NY, USA

Environmental Council (2008-2010), The Business Council of NY State (BCNY), NY, USA

Summary of Experience

Relevant Experience

- **Principal Environmental Engineer –**
- **Senior Vice President –**
- **Vice President**
- **Managing Director**
- **Managing Director**
- **Associate**
- **Senior Project Manager**
- **Senior Scientist**
- **Environmental Engineer**

- **Environmental Impact Assessments, Phase I ESAs, and Phase II ESIs - Clients: Developers, Property Managers, Environmental Attorneys, Architects, Banks, and Insurance Firms**

TAREK Z. KHOURI, P.E. *Principal Environmental Engineer*

- **Remedial Investigation, Remedial Design and Associated Remediation Projects - Clients: Developers, Property Managers, Environmental Attorneys, Architects, Banks, Insurance Firms -**

- **LIRR/MTA East Side Access Project, New York, NY - Client: MTA**

- **Hudson Yards, Proposed New York Jets Stadium, New York, NY – Client: NY Jets -**

- **Columbia University Manhattanville Expansion Project, New York, NY – Client: Columbia University -**

- **Potable Water System Testing for Lead, New York, NY – Client: NYCSCA**

schools'

- **City University of New York, Tank Rehabilitation, Remediation and Closure Program, New York, NY – Client: DASNY -**

TAREK Z. KHOURI, P.E. *Principal Environmental Engineer*

- **Active Fuel Oil Terminal, Brooklyn, NY – Client: Bayside Fuel Oil Depot Corporation -** . Developed and executed a strategy to manage client's

- **54 Rutledge St, Insitu Bio-Remediation, Brooklyn, NY – Client: Fortis Property Group -**

- **Circuitron Corporation Superfund Site, Ground Water Treatment System, East Farmingdale, NY – Client: USACE**

- **Constructability Review – Justice Sonia Sotomayor Houses, Bronx, NY – Client: NYCHA -** operty's main loop and improvements to entrances, lobbies

- **LCP Chemicals Inc. Superfund Site, Linden, NJ – Client: LCP Chemicals Inc. -** 's Occupational Safety & Health Award Citation of Merit of

- **FAA Technical Center, PCB Soil Remediation at Area 20A Superfund Site, Atlantic City, NJ – Client: USACE -**

TAREK Z. KHOURI, P.E. *Principal Environmental Engineer*

- **FAA Technical Center, Area D Jet Fuel Farm Superfund Site, Atlantic City, NJ – Client: USACE**

- **US Federal Government, Anthrax Investigation, New Jersey and New York – Client: USPS -**

International Representative Projects

- **Global Infrastructure Project, Harare, Zimbabwe –** ,000 unit's housing project, resorts, telecommunication improvement, and assessing

- **OQYANA World First, Dubai, UAE –** engineering evaluations of the island's p

- **Normandy Landfill Treatment Project, Beirut, Lebanon** of a 60 acres' landfill reclamation project. Additionally, I corresponded with management,

- **Beach Restoration, Al Athaiba Beach (Muscat, Oman) and Saint Germain sur Ay Beach (La Manche, France) -**

Publications

HydroTech Environmental
ENGINEERING AND GEOLOGY, DPC

Paul I. Matli, Ph.D., P.G.
VICE PRESIDENT

Ph.D., Environmental Sciences, Tokyo University of Agriculture and Technology, Japan, 2002

M.S., Environmental Sciences, International Center for Advanced Mediterranean Agronomic Studies, Greece, 1997

B.S. Agriculture Engineering, Saint Joseph University, Lebanon, 1994

Accredited US Educational Equivalence of Ph.D., M.S. and B.S. by Globe Language Services, Inc.

OSHA Certifications/Training

40-Hr HAZWOPER
8-Hr HAZWOPER Refresher
30-Hr Construction Safety and Health
10-Hr Construction Industry

Professional Licenses

New York State Professional Geologist (License # 000186)

Affiliations

Member of the American Institute of Professional Geologists since 2015 (Membership # 2784)

Summary of Experience

Mr. Matli has over sixteen (16) years' of experience in environmental engineering and geology with established records of project portfolio management of remedial investigations, design and oversight of remedial cleanup and remedial closures at inactive hazardous waste disposal sites, Brownfield Cleanup Program (BCP) sites, Voluntary Cleanup Program (VCP) sites, Little-E designation sites, petroleum spill sites, former landfills and Superfund sites. Mr. Matli's extensive experience involves the preparation of Environmental Assessment Statements (EAS), Phase I Environmental Site Assessment (ESA) reports, Phase II Remedial Investigations Reports/Site Characterization Reports (RIR), Pilot and Feasibility Studies, Remedial Action Work Plans (RAWP), Construction Completion Reports (CCR), Site Management Plans (SMP) , Remedial Action Reports (RAR) and Final Engineering Reports (FER) for commercial and residential development complexes, auto related workshops, dry cleaners, manufacturing and industrial blocks. Mr. Matli has been in charge of providing technical guidance of all aspects of fieldwork including geophysical and sub-surface drilling activities for installing soil probes, monitoring wells, soil/sub-slab vapor implants, media monitoring and sampling, petroleum bulk storage tanks assessments as well as designing and installing vapor barriers, Sub-Slab Depressurization Systems (SSDS) and Soil Vapor Extraction (SVE) systems.

Relevant Experience

Brownfield Cleanup Program Remediation Of DNAPL Via *In-Situ* Chemical Oxidation/Bioremedial Agents And Active Vapor Mitigation Systems, Vleigh Place, Flushing, NY - Client: United Properties Corp. & VP Capital Holdings, LLC – As an Environmental Project Manager for this site, I was involved in the initial soil and groundwater assessments to investigate environmental impacts associated with the presence of an on-site drycleaner. These investigations confirmed on-site discharges of chlorinated solvents impacting thirteen storefronts located on-site. The former owner expressed interest in the New York State Department of Environmental Conservation (NYSDEC) BCP and I worked with this owner to apply to the program as a Participant. I then prepared and coordinated all necessary documents for the transition of this site into the BCP. Under BCP, I performed additional subsurface delineation of soil and groundwater impact as well as the extent of vapor intrusion impacts on-site and off-site. Besides a I conducted receptor survey that confirmed the presence of a significant threat to the health of 13 commercial tenant located on-site and occupant of two adjacent residential complexes. Immediate remedial activities were required on-site and off-site. As environmental engineer I was involved the design and installation of interim vapor mitigation systems inside the 13 on-

site tenant spaces prior to their destruction by a fire in 2016. I was then involved in the design and installation of an interim Soil Vapor Extraction (SVE) system to prevent the migration of chlorinated vapor into adjacent residential buildings. Under the directions of an NYS Licensed Professional Engineer (PE), I had the direct responsibility of preparing and implementing a NYSDEC-approved RAWP. RAWP activities consisted of a site-wide soil excavation, multiple rounds of in-situ groundwater treatment by chemical oxidation brand name PersulfOx and a bioremedial agent brand name 3_D Microemulsion Factory Elumlsified (3DME) followed by several rounds of post-groundwater remediation sampling events. A total of 48,830 cubic yards of non-hazardous fill material and a total of 1,080 cubic yards of former concrete foundations were also removed during site excavation for future redevelopment. In addition, monitoring of soil vapor intrusion has also been performed off-site in surrounding sidewalks and adjacent buildings including a daycare facility. The Site remediation was completed by achieving the Unrestricted Soil Cleanup Objectives for the soil cleanup and the Track 4 Cleanup Goal for the Site. Using an innovative and affordable remedial design, I was able to stay within budget, prepare an SMP and an FER and help my client receive the tangible tax credits by completing the BCP milestones and receive a NYSDEC-issued Certificate of Completion (COC) within two years of NYSDEC RAWP approval. The site is currently under a post-remediation Site Management Plan, which includes a groundwater sampling program, SVE monitoring program, an SSDS installation and monitoring at adjacent property (2014 - Ongoing).

Brownfield Cleanup Program Remediation Of Historic Railroad Freight Yard And Manufacturing Site, East 135th Street, Bronx NY – Client Deegan 125th Realty LLC – Project Site involved the redevelopment of a 1.112-acre site into two 25-story mixed residential and commercial use towers with full basements and parking/driveways over of two unexcavated public utility easements. With the active involvement of HydroTech, the Site was initially enrolled for remediation under the NYC Mayor's Office of Environmental Remediation (OER) VCP program. With its location in the En-Zone along with the presence of soil impacts from historic uses, I identified this Site as an opportunity for the NYSDEC BCP and I worked with the developer to apply to the program as a volunteer. Once the site was accepted into the BCP program, I performed a Focused Site Characterization and prepared a NYS Licensed PE – certified RAWP with a Track 1 Cleanup Goal. During remedial excavation into the interim unsaturated soil, residual soil contamination could not be removed over 63.6% of the Site perimeter and as such, Track 1 Cleanup Goal was achieved over 0.0405 acres and Track 4 cleanup was achieved over 0.707 acres. As the project manager and project geologist, I provided all necessary support during Site remediation including but not limited to obtaining a Quality and Quantity Dewatering Permit from NYCDEP, perform soil waste characterization and coordinate approvals by soil disposal facilities of 36,048 tons of non-hazardous soil disposed of this project, and also coordinate regulatory approvals of 7,680 tons of required backfill material imported to the site. At the completion of the remedial development, I prepared and submitted to NYSDEC an SMP and a NYS Licensed PE – certified FER. NYSDEC-issued a COC within 30 months of NYSDEC RAWP approval. The site is currently under the post-remediation site management inspection and reporting of a composite cover (2015 – Present).

Management Of Cleanup Of Hazardous Materials At A Former Rubber And Adhesives Factory, 9th Street, Long Island City, NY – Client 9th Street LIC – This project site was historically used for adhesives manufacturing for approximately 62 years and a site environmental characterization identified the presence of hazardous chemical waste beneath the property. After thirteen years of no response by former ownership to address site remediation pursuant to a NYSDEC consent order, a new ownership became involved as a respondent to the Consent order and has requested HydroTech to expedite a design for a site cleanup that should be completed within less than 3 months during the layout of a new building foundations. As a Project Manager, I prepared a NYS licensed PE-certified Interim Remedial

Measures Work Plan (IRM WP), which underwent within less than 3 months four revisions due to evolving site information related to underlying bedrock and perched water. The IRM WP included specific soil cleanup methods and selected remedies dictated by NYSDEC that included a design for an SVE system and subsequently a SSDS. IRM activities completed during a first phase included a further delineation of hazardous contamination in soil across the site, groundwater sampling for emerging contaminants and volatile organic compounds, soil waste characterization, acquisition of a dozen Contained-in Determination letters from NYSDEC for non-hazardous waste, proper disposal of 1,123.24 tons of hazardous soil and 5,362.54 of non-hazardous soil, disposal of 45,371 gallons of non -hazardous liquid from dewatering and truck wash/decontamination pad, closure and removal of 9 underground storage tanks (USTs) listed in the Petroleum Bulk Storage (PBS) database and Chemical Bulk Storage database. My project oversight included monitoring day-to-day construction operations by directing a field crew consisting of a geologist, a community air monitoring technician and a technician for odor suppression. The second phase of IRM activities were upgraded consistent with site development. These activities were detailed in an NYSDEC-approved IRM WP Addendum and will resume upon completion of building construction (2019 – Present).

Remedial Development And Spill Closure At A Gasoline Station, 11th Avenue, New York, NY – Client: Sam Ruv Operating Corp. – This project involved remedial redevelopment activities at a former gasoline filling station and an auto repair facility into a 10-story commercial building. My duties as a Qualified Environmental Professional (QEP) included the performance of a remedial investigation addressing a Little E-Designation for hazardous materials. The investigation was conducted per a NYCOER Remedial Investigation Work Plan. In-situ petroleum releases identified during this investigation lead to the opening of an NYSDEC petroleum spill case. I prepared a Remedial Action Work Plan which included a design for a waterproofing vapor barrier under the directions of a NYS Licensed PE and oversaw the implementation of remedial activities in coordination with OER as part of a Voluntary Clean-Up Program (VCP) and under the authority of NYSDEC as part of spill remediation. During site remediation, non-hazardous petroleum contaminated soil/fill was excavated and removed from the property pursuant to a soil Waste characterization exercise, which I conducted, beforehand. In addition, gasoline and diesel underground storage tanks were properly closed and removed from the properly in compliance with applicable laws and regulations. As part of site development, the vapor barrier system that consisted of a waterproofing membrane was installed beneath the hydrostatic slab across the footprint of the building. At the completion site remediation, a decision for a No Further Action was issued by NYSDEC for the spill incident and achieved a Track 1 Cleanup Goal was achieved under which condition, the Little E-Designation for hazardous materials was removed to the Satisfaction of the NYCOER (2015 - 2018).

Integrated Remedial Options For Mixed Use Site Redevelopment And Management, Canal Street, New York, NY – Client: CBCS Hudson Equities, LLC – As an Environmental Project Manager for this Site, I assisted a NYS Licensed PE during the preparation of RAWPs addressing the remediation of an NYSDEC petroleum spill case in accordance to NYSDEC requirements and also a Little E-designation for hazardous materials in accordance with NYCOER guidance and approvals. I designed, coordinated and directed the performance of remedial activities during site development into a 10-stroy hotel. The scope of these activities consisted of the performance of a soil waste characterization, *in-situ* groundwater treatment by Chemical Oxidation brand name RegenOx™ and bioremedial agent identified as Oxygen Releasing Compounds Advanced (ORCA), the proper closure and removal of a waste oil and gasoline USTs, soil waste characterization, excavation of impact fill material and petroleum impacted soil to below the depth of soil groundwater interface and disposal of non-hazardous regulated waste, collection and analysis of post-excavation endpoint sample, application of Oxygen Releasing Compound Advanced (ORCA) pellets at bottom of excavation, the installation of an active SSDS and a waterproofing vapor barrier and the institution of a groundwater monitoring and sampling program leading to the final closure of NYSDEC spill case. Performed annual inspection of installed engineering controls consisting of

vapor barrier, SSDS and concrete slab to monitor their environmental function for the protection of the health of building occupants pursuant to an OER-approved Site Management Plan (SMP) (2010 - Ongoing).

Petroleum Spill Remediation And Soil Vapor Mitigation At A Former Gasoline Station, Cropsey Avenue, Brooklyn, NY – Client: Avo Construction – The project site is a former gasoline station and auto repair facility associated with an NYSDEC gasoline-related spill case. This site was then redeveloped into seven 3-story residential buildings. As a project geologist I managed the entire remediation of residual gasoline constituents in soil and groundwater beneath the new vacant building and the mitigation of gasoline vapors detected in the basement and first floor at this development. The mitigation of gasoline vapors were undertaken following a regulatory order issued by the New York State Department of Health (NYSDOH) through the NYSDEC and the New York City Department of Health (NYCDOH) preventing this site from being occupied before taking the necessary measures to render it protective to human health. I designed and installed individual active SSDS in each of the seven 3-story vacant residential buildings following a quantitative pre-mitigation diagnostic testing exercise, which I performed pursuant to NYSDEC and NYSDOH approvals. The seven SSDSs were adequately designed to eliminate the potential vapor intrusion pathway between the vapor source (soil and groundwater) and the receptor (indoor air within the building interior). Upon verifying the SSDS successfully prevented the sub-slab gasoline vapors from impacting the indoor air, the NYSDEC in consultation with NYSDOH and NYCDOH authorized the occupation of the seven new developments at this site. The remediation of gasoline constituents in soil and groundwater was then performed following a complete delineation of contamination on-site and off-site. This remediation involved three rounds of off-site groundwater treatment by RegenOx™ and also ORCA. Upon reducing the levels of contaminants to levels satisfactory to NYSDDEC, a decision for a No Further Action was issued by NYSDEC for the spill incident (2010 - 2017).

Site Cleanup For Affordable Residential Redevelopment, Third Avenue, Bronx, NY – Client : Strategic Development & Construction Group – This project consisted of a remedial development of a new 7-story low income/supportive housing residential building with a full cellar located on the west side of Third Avenue in the Morrisania Section of the Bronx that is mostly a low income residential neighborhood. The new building is owned and operated by Services for the UnderServed (SUS), a non-profit agency that provides housing and support services for formerly homeless and other qualified residents. As an Environmental Project Manager for this Site I had to complete several project milestones leading to the finishing of this remedial development. These project milestones included the preparation of an Environmental Assessment Statement (EAS) and Environmental Assessment (EA) to obtain funding from the U.S. Department of Housing and Urban Development's (HUD) HOME Investment Partnership Program (HOME) funding through HPD's Supportive Housing Loan Program. My duties also involved fulfilling the remedial requirements of a Little E-designation for hazardous materials in accordance with City Environmental Quality Review (CEQR) requirements and a NYCOER-approved RAWP pursuant to the NYC VCP. The implementation of RAWP during building construction lead to the identification of hazardous levels of lead in 60 percent of the site soil/fill material through soil waste characterization investigation and several delineation investigations. The project disposed of 2,474.4 tons of hazardous lead contaminated soil. The remedial goal of a Track 1 cleanup was achieved following site cleanup. I was the recipient for the 2016 Big Apple Brownfield Award for Supportive/ Affordable Housing issued for this project by the New York City Brownfield Partnership (2013 - 2015).

Landfill Remedial Monitoring, Paerdegat Basin Natural Area Park, Brooklyn, NY – Client : New York City Department of Environmental Protection (NYCDEP) – This project is an artificially created basin out of Bedford Creek, a freshwater tributary to Jamaica Bay. The basin was impacted by conveying street runoff directly from stormwater and combined sewer overflows from highly urbanized neighborhood and also by dredging conducted during the early twentieth century and historic fill in the South Natural Park Area. Approximately, 177 acres of Paerdegat Basin shoreline and submerged land were restored to

parkland including a Natural Area Park and Ecology Park. In order to correct the degraded water quality conditions in Paerdegat Basin, groundwater sampling was performed to evaluate whether the designated contaminants identified by prior investigations within the urban fill material of the South Natural Park Area have potentially impacted the groundwater after the construction of the Natural Area Park and Ecology Park. As an Environmental Geologist for this site, I performed groundwater sampling per Investigation Work Plans, which I prepared and were approved by NYSDEC and NYCDEP. Groundwater investigations were performed once at pre-construction and several time at post-construction at the Natural Area Park and Ecology Park. These groundwater investigations involved the installation and development of monitoring wells, the sampling of monitoring wells per USEPA low flow samling methods and the sampling of surface water during periods of low tides and high tides with specially designated Quality Assurance Project Plans. I documented the findings of these investigations in groundwater investigation reports to the satisfaction of NYCDEP and NYSDEC (2014 - 2016)

Industrial Air Quality Assessment For Office Conversion Into A Daycare Facility, 40th Avenue, Queens, NY - Client: Peachy Enterprise, LLC - This project addressed the CEQR Technical Manual – Chapter 17 provisions for hazardous materials associated with suspect on-site and off-site historic uses and also an air quality impact assessment in anticipation of the conversion of an office space to a day care center within an existing office building located in M1-3 manufacturing zone under a special permit from the New York City Board of Standards and Appeals (BSA). As an Environmental Project Manager for this site, I performed a Hazardous materials investigation in accordance to NYCDEP-approved investigation work plan, which I prepared. I also prepared a NYCDEP-approved RAP, which was certified by a NYS Licensed PE. I also prepared an air quality impact assessment to the satisfaction of NYCDEP and this assessment involved a boiler screen analysis per CEQR guidance as well as a basic screening of industrial mobile and stationary sources using EPA's AERSCREEN screening dispersion models and detailed analysis using EPA's AERMODE dispersion model. Findings of air emissions provided by these models were compared to NYSDEC's Guidelines for the Evaluation and Control of Ambient Air Contaminants under 6 NYCRR Part 212 Process Operations DAR-1 Annual Guideline Concentrations (AGC) and Short-Term Guideline Concentrations (SGC) Tables Guidance documents. Upon verification that air pollutant concentrations are below the impact criteria, NYCDEP issued a sign-off on the submitted air quality impact assessment documents and back-up materials and issued a notice to proceed for the establishment of the day care facility (2013 - 2014).

Marie Rose Farah

Mf799@cornell.edu| New York, NY 10019| cell: 607.262.3265

EDUCATION

Cornell University College of Engineering **Ithaca, NY |2023-2024**

M.Eng, Environmental Engineering| Sustainable Energy Management specialization| **Summa Cum Laude** | **GPA:4.00**

- Act Forward Scholarship Life Scholarship, Alexis & Anne Marie Habib Scholarship, The Arab American Association of Engineers and Architects in the US: Recognized my academic achievement and provided funds for my education
- ***Earth Source Heat Fellow:*** Developed strategies to enhance waste diversion practices, contributing to sustainability goals and improving overall resource efficiency for Cornell Energy and Sustainability Department

Notre Dame University College of Engineering **2013-2018**

Bachelor of Civil and Environmental Engineering, **Cum Laude**

PROFESSIONAL EXPERIENCE

Hydrotech Engineering and Environmental Services **New York, NY| May-Present**

***Senior Environmental Consultant*| Hydrotech**

- Led environmental compliance for a Metropolitan Transportation Authority (MTA) $500M renovation project overseeing air monitoring, waste disposal, and recycling—with 100% regulatory adherence
- Developed environmental remediation plans addressing Recognized Environmental Conditions (RECs) identified during site assessments, ensuring full regulatory compliance and risk mitigation
- Collaborated with contractors and field teams to integrate environmental performance metrics and contribute to the project's sustainability reporting and KPIs
- Conducted environmental footprint assessments for remedial action plans—measuring GHG (CO_2), NOx, SOx, and PM—and prepared reports for DEP compliance

Langan Engineering **Philadelphia, PA| 2024-March**

***Environmental Consultant*| Langan**

- Delivered E&S due diligence to support stakeholder decisions and accelerate project timelines, with clear reporting on sustainability progress and KPIs
- Achieved 95%+ adherence to schedules and budgets by leading field teams, coordinating with stakeholders, and developing actionable remediation plans that ensured 100% regulatory compliance across multiple sites
- Co-authored Phase 1 & 2 Environmental Impact Assessments for top 5 U.S. tech companies while integrating ESG considerations into business operations and long-term sustainability planning

Reborn| **Lebanon| 2022-2024**

***Co-founder & Sustainability lead*| Reborn**

- Managed financial planning and analysis for the startup, oversaw budgeting and forecasting processes to ensure sustainable growth and operational efficiency
- Conducted detailed life cycle assessments to evaluate financial impacts and enhance accountability across the supply chain, resulting in strategic decision-making that aligned with sustainability goals
- Improved supply chains to boost efficiency by 30% and cut carbon emissions by 30%, contributing to Reborn's B Lab certification through targeted sustainable initiatives

Berytech **Lebanon| 2022-2023**

***Cleantech Consultant*| Berytech**

- Consulted with over 30 startups, aligning their go-to-market strategies with financial analysis and market insights, resulting in successful product launches and improved financial performance
- Built 5-year financial projection models to assess valuation, inform investment decisions, and support due diligence.
- Led USAID-backed agri-food project, boosting Small and Medium Enterprises (SMEs) productivity and sales by 20–40% through tailored programs

Compost Baladi **Lebanon | 2018-2022**

***Project Coordinator*| Compost Baladi**

- Secured $1M+ in donor funding to build innovative municipal composting and wastewater treatment facilities
- Designed and implemented decentralized wastewater treatment systems for refugee camps in collaboration with UNICEF
- Led consulting for the Polish Center for International Aid (PCPM), converting biosolids from sludge into usable resources, supporting circular economy goals

ADDITIONAL INFORMATION

- **Software & Technology**: Advanced Excel, Confluence, R, Matlab, C++, GPS-X, JotForm, AutoCAD, ESG Insight Pro
- **Product Validation & Development**: Google Design Sprint & Thinking, Project Sprints
- **Languages**: English (fluent), Arabic (fluent), French (fluent)
- **Certification**: MTA NYC Transit Track Safety Certified, OSHA 30- hour Construction Health and Safety, 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER)
- **Award:** 2025 Global Youth Climate Ambassador by the World Bank

Dr. Mohammed I. Al-Qinna

Associate Professor in Environmental Soil Physics & Irrigation

KEY QUALIFICATION

I have more than 26 years of professional experience in agricultural–environmental management, climate change analytics, hydrology, smart irrigation, soil–water–plant systems, environmental modelling, and sustainable land and water resource development. My work spans national and international programs across the Middle East and Gulf region, where I support the design, monitoring, evaluation, and policy development of complex environmental and agricultural projects.

Alongside this multidisciplinary background, I also have strong expertise in environmental data validation, QA/QC evaluation, and data usability assessment using internationally recognized frameworks. My work aligns with major global standards including USEPA SW-846 analytical methods, the USEPA Contract Laboratory Program (CLP), the USEPA National Functional Guidelines (NFG) for organics and inorganics, and USEPA QA/QC guidance for sampling and analysis. In addition, I apply international ISO standards, particularly ISO/IEC 17025 for laboratory competence, ISO 5667 for water sampling, ISO 18400 for soil quality and sampling, and ISO 18512/24095 for dust and analytical QA/QC. Together, these frameworks allow me to ensure that environmental datasets—water, soil, dust, wastewater, groundwater, and agricultural samples—are scientifically defensible, traceable, and suitable for modelling, reporting, and decision-making.

My analytical and data-science capabilities include data mining, environmental statistics, and advanced modelling, supported by experience with major analytical platforms such as SAS, JMP Pro, SPSS, Minitab, Python, and R, as well as geospatial and modelling tools such as ArcGIS, QGIS, MODFLOW, HYDRUS, SWAT, AquaCrop, DSSAT, and remote sensing systems. This combination of environmental expertise and analytical proficiency enables me to integrate validated data into climate, hydrological, environmental, and agricultural assessments with high confidence.

Throughout my career, I have implemented and delivered capacity-building programs for ministries, laboratories, universities, and international organizations on climate change, environmental monitoring, QA/QC, data validation, smart irrigation, and integrated natural resource management. My work continues to support evidence-based policy development, improved environmental governance, agricultural productivity, and climate resilience across the region.

EDUCATION

PhD. In **Environmental Soil Physics**. 2003. Department of Crop, Soil, & Environmental Sciences, Faculty of Agriculture, University of Arkansas, Arkansas, USA. Dissertation title: "***Measuring & Modelling Soil Water & Solute Transport with Emphasis on Physical Mechanisms in Karst Topography***". Advisor: Prof. Don H. Scott

M.S. In **Soil & Irrigation**. 1997. Department of Soil & Irrigation, Faculty of Agriculture, University of Jordan, Amman, Jordan. Thesis Title: "***Infiltration and Soil Water Storage as Affected by Irrigation Methods in Al-Muwaqqar Region***". Advisor: Prof. Ahmad Abu-Awwad

B.S. In **Soil & Irrigation**. 1994. Department of Soil & Irrigation, Faculty of Agriculture, University of Jordan, Amman, Jordan.

Phone: +962 79 6700222, P.O. Box 926804, Zip Code 11190, Amman, Jordan,
e-mail: qinna@hu.edu.jo; e-mail: mqinna@hotmail.com

AREAS OF SPECIALIZATION

- **Sustainable Land & Rangeland Management –** conservation agriculture, soil restoration, land rehabilitation, and integrated rangeland strategies for arid and semi-arid regions, with emphasis on climate resilience and long-term land productivity.
- **Soil Physics, Soil Quality & Productivity Enhancement –** advanced evaluation of soil physical, chemical, and biological properties; soil amendment trials; fertility optimization; and enhancement of soil structure and microbial activity for improved land performance.
- **Soil–Water–Plant–Climate Interactions –** climate-smart agriculture, SMART irrigation, fertigation, deficit irrigation, and soilless agricultural systems (hydroponics, NFT, DWC, climate-controlled greenhouses), focusing on maximizing WUE and crop performance.
- **Irrigation & Water Resources Management –** design, modelling, monitoring, and evaluation of pressurized irrigation systems; automated and sensor-based irrigation; water-saving technologies; and integrated water resources management (IWRM) for agriculture and ecosystem protection.
- **Climate Change Assessment & Policy Development –** national climate vulnerability and impact assessments, mitigation and adaptation planning, downscaled climate modelling, UNFCCC reporting (NCs, BURs, NDCs, NAP), and authorship of national climate change policies and frameworks.
- **Environmental Data Validation & QA/QC –** verification and validation of environmental, agricultural, and analytical datasets (water, soil, dust, wastewater, groundwater) using international frameworks including USEPA SW-846, USEPA CLP, USEPA National Functional Guidelines, NYSDEC DER-10, FAO and WHO environmental standards, USDA soil/water guidelines, and ISO/IEC 17025 and ISO sampling standards (ISO 5667, ISO 18400, ISO 18512). Ensuring scientific defensibility, reliability, and regulatory compliance of datasets used in modelling, monitoring, and decision-making.
- **Data Analytics, Data Mining & Modelling –** advanced environmental statistics, machine learning, and data mining using SAS, JMP Pro, SPSS, Python, R, and mathematical/spatial modelling for land degradation, desertification, salinization, climate variability, and solute/contaminant transport.
- **Geospatial Strategy, GIS/RS & Enterprise Data Systems –** design of integrated geospatial strategies and environmental/agricultural data systems; conceptual and logical data modelling; enterprise data architecture; and GIS/remote sensing applications for land–water–agriculture management.
- **Hydrology & Contaminant Transport Modelling –** simulation of water and solute movement in heterogeneous soils and karst systems; groundwater recharge and pollution risk mapping; drought and flood assessments; and modelling using MODFLOW, HYDRUS, SWAT, AquaCrop, and GeoStudio.
- **Environmental Assessment & EIA –** assessment of soil, water, groundwater, and ecological systems under agricultural, urban, and industrial pressures; identification of environmental risks, pollution pathways, and mitigation options.
- **Agricultural Strategy, Policy & Sector Development –** development of regional agricultural strategies, production system optimization, sectoral assessments, tariff and market analyses, and agriculture-driven economic development planning.
- **Capacity Building, Advisory Services & Institutional Strengthening –** design and delivery of technical training programs, farmer field schools, ToT modules, and institutional capacity development on smart irrigation, climate change, environmental monitoring, QA/QC, WEFE Nexus, and sustainable land–water management.
- **Gender, Livelihoods & Rural Development –** design and implementation of livelihood diversification programs, women-led agriculture initiatives, and rural innovation projects linking environmental sustainability with community empowerment.

- **Project Leadership, Monitoring & Evaluation –** management of large-scale, multi-stakeholder environmental and agricultural projects; development of monitoring frameworks; reporting; extraction of lessons learned; and documentation of success stories for national and international partners.

WORK EXPERIENCES

2025 – Now	Dean Assistant for Academic Development, Prince El Hassan Bin Talal Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2021 – 2025	Agriculture / Land, Water, and Environment Management, Consultant and Project Manager at The Palladium Group, Ministry of Environment, Water, and Agriculture (MEWA), KSA.
2020 – 2021	Associate Professor, Department of Land Management & Environment, Prince El Hassan Bin Talal Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2019 – 2020	Associate Professor, Department of Land Management & Environment, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2018– 2019	Department Chairman, Department of Land Management & Environment, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2017– 2018	Vice Dean, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2015 –2017	Department Chairman, Department of Land Management & Environment, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2014 – Now	Associate Professor, Department of Land Management & Environment, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2010 – 2011	Vice Dean, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2008 – 2010	Dean Assistant, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2005 – 2006	Department Chairman, Department of Land Management & Environment, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2003 – 2014	Assistant Professor, Department of Land Management & Environment, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan.
2000 – 2003	Graduate Assistant, Department of Crop, Soil, & Environmental Sciences, Faculty of Agriculture, University of Arkansas, Arkansas, USA.
1998 – 1999	Research and Teaching Assistant, Department of Land Management, Institute of Land, Water and Environment, Hashemite University, Zarqa, Jordan.
1997 – 1998	Research Assistant, Jordan Arid Zone Productivity Project, Faculty of Agriculture, University of Jordan, Amman, Jordan.
1994 – 1997	Teaching Assistant, Dept. of Soil Science & Irrigation, Faculty of Agriculture, University of Jordan, Amman, Jordan.

COMMUNITY SERVICES ACHIEVEMENTS

Outside the University

- Member of the National Committee to Combat Desertification in Jordan, Ministry of Environment, Amman, Jordan.
- Member of the Climate Change Thematic Research Group at the Ministry of Environment, Ministry of Environment, Amman, Jordan.
- Member of the Agriculture and Environment Technical and Consulting Council at the Higher Council for Scientific Research.
- Member of the Accreditation and Quality Assurance for Higher Education Institutional Council for Land,

Water and Environment Program, Ministry of Higher Education and Scientific Research.

- Member of the Water Resources and Environment Division Committee, Jordanian Agriculture Engineers Association.
- Member of the steering committee to supervise the preparation of the national strategic document for Ministry of Environment entitled (Jordan Environment 2030)

Within the University:

- Member of Arid Land Academy Council 2016, 2017, 2018.
- Committee Member of the University Scientific Research, 2015, 2018.
- Committee Member of the University Graduate Studies 2014, 2017.
- Environmental Club Counsellor at the Hashemite University.
- Member of the Jordanian Ranking for Universities 2018, 2019.
- Member of the Academic Quality Assurance Council, Academic Quality Assurance at the Hashemite University.
- Member of University Research Participation in the 1st Student Scientific Research.
- Member of the development Committee to Identify and Evaluate the Effectiveness of Teaching Process.
- Member of the Election Commission in the Hashemite University.
- Committee Member of the Detailed Geological and Hydrological Maps Committee.
- Committee Member to Study the Draft Line Carrier and the Reuse of Treated Water to the University.
- Committee Member to Study the Draft Water Harvesting at the Hashemite University.
- Committee Member for the establishment of a Wastewater Treatment Plant at the Hashemite University.
- Committee Member to Identify and Record the Available Natural Resources in Zarqa Governorate.
- Committee Member for Studying the Hashemite Brigade afforestation Project to Reduce Pollution.
- Committee Member for the preparation of the (collapsed) and the Handbook on Faculty of Natural Resources and the Environment.
- Member of the College for the Tempus Foundation.
- Committee Member for investigating on the Impact of Wastewater Coming from Free Zones Corporation Hashemite University.
- Committee Member of the Environmental Activities at the Hashemite University.
- Committee Member of the Master Program entitled "Climate Change and Sustainable Land Management", directed and funded by MAPEC, 2013/2015.
- University Committee Member for updating the Educational Curriculum, 2014.
- Consultant for the university committee to establish Arid Lands Academy (ALA) at the HU campus, 2014.
- Member of Program entitled “Development of Interdisciplinary Programmes on Climate Change & Sustainability Policy (CLIMASP)” Funded by TEMPUS, 2014.
- Member of the Program entitled "Geodesy and Geoinformatics for Sustainable Development in Jordan (GEO4D)" Funded by Erasmus+, 2017.
- Chairman of the Potential Trees and Plants Plantation Booklet, 2018.

Within the Faculty:

- Vice Dean of the Faculty of National Resources and Environment.
- Dean Assistant for students' affairs at the Faculty of National Resources and Environment.
- Head and member of Land Management and Environment Department Council.
- Member of Faculty of Natural Resources & Environment Council.
- Department and Faculty head and member of the Undergraduate Programs Committee.
- Department and Faculty head and member of the Appointment and Promotion Committee.
- Department and Faculty Council head for Student Training.
- Department and Faculty head and member of the Postgraduate Programs Committee.
- Department and Faculty head and member of the Scientific Research Committee.

- Member of the Scientific Journals and Text Books Committee.
- Department and Faculty head and member of the Examination Committee.
- Department and Faculty head and member of the Students Curriculum.
- Department and Faculty head and member of the Technical Scientific Laboratories Equipment Committee.
- Department and Faculty head and member of the Workshops and Seminars Committee.
- Department and Faculty head and member of the Association Council.
- Head and Member of the Faculty Budget Committee.
- Department and Faculty head and member of the University and Society Committee.
- Head of the Faculty Web Site Development Committee at the Faculty.
- Department and Faculty head and member of the Students Discipline Committee.
- Department and Faculty head and member of the Committee on Stimulating Students' Enrolment for the Master Programs Offered in the Faculty.
- Department and Faculty head and member of the Student Guidance Committee.

PROJECTS & CONSULTATIONS

1. ***Design of Climate-Smart Soilless Agricultural Demonstration Systems,*** IUCN, King Salman Bin Abdulaziz Royal Natural Reserve KSA, 2025-now.
2. ***Aseer High Potential Sectors Assessment: Comprehensive Current Assessment of the Agriculture Sector and Opportunities.*** Aseer Development Agency (ASDA), KSA, February to August, 2025.
3. ***Studying the impact of raising water and electricity tariffs on farms in the Emirate of Dubai.*** Agriculture Department, Dubai Municipality, UAE, 2024-2025.
4. ***Building Agriculture Strategy for Agriculture Production in Dubai*.** Agriculture Department, Dubai Municipality, UAE, 2024-2025.
5. ***Developing of Sustainable Rangeland Management Plan***, National Center for Vegetation Cover Development and Combating Desertification. Hafr Al-Batin, KSA, 2023-2024.
6. ***Geospatial Strategy for Ministry of Environment, Water, and Agriculture***, Ministry of Environment, Water, and Agriculture, Riyadh, KSA, 2022-2023.
7. ***Enhancing NEOM Land Productivity through Soil Amendments***, The Palladium Group, NEOM, Tabuk, KSA, 2022-2024.
8. ***Sustainable Farm Modelling,*** The Saudi Irrigation Organization, KSA, 2022-2023.
9. ***Jordan UN Common Country Assessment (CCA) to feed into the UN Sustainable Development Cooperation Framework (CF).*** FAO, Jordan, 2021-2022.
10. ***4th National Communication Report for the UNFCCC***. United Nations Development Programme (UNDP), Jordan, 2021-2023.
11. ***Climate Change Policy (2020-2050)***. United Nations Development Programme (UNDP), Jordan, 2020.
12. ***SDG Climate Facility country grant proposal development.*** United Nations Development Programme (UNDP), Jordan, 2020-2021.
13. ***Mid-Term Evaluation for Jordan's Adaptation Fund Program titled "Increasing the Resilience of Poor and Vulnerable Communities to Climate Change Impacts in Jordan through Implementing Innovation Projects in Water and Agriculture in Support of Adaptation to Climate Change".*** Arabtech Jardaneh, Ministry of Planning and International Cooperation, Amman, Jordan, 2020.
14. ***Potential of AquaSource for Jordan: Alleviating Plant Stress from Water Shortage.*** Ecotechnology LLC-Armenia, and The Hashemite University-Jordan, Funded by INNOWWIDE program, European Union, 2020.
15. ***Strengthening the national water governance capacities in drought management project: Drought Vulnerability & Impact Assessment for Amman-Zarqa, Yarmouk Basins, Azraq & Mujib Basins.*** United Nations Development Programme (UNDP), Jordan, 2019.
16. ***Analysis of the Impacts of Future Droughts on Water and Sanitation Systems in Jordan.*** Funded by ICBA, 2019.
17. ***Protection of Water Dams in Jordan through Labour-Intensive Activities.*** Funded by GIZ, Amman, Jordan, 2018.

18. ***Participatory Consultation and Drafting of the National Climate Change Adaptation Plan (NAP); Climate vulnerability and Agriculture/Land Management Expert.*** IUCN West Asia Regional Office, funded by GIZ, Amman, Jordan, 2018.
19. ***Preparation of the Project Document for "Fourth National Communication and Second Biennial Update Report under the UNFCCC" project.*** United Nations Development Programme (UNDP), Jordan, 2018.
20. ***Comprehensive Assessment Report for the State of Methane and its Mitigation Potential in all relevant sectors and activities in Jordan*** Within the Project Title "Supporting National Planning for action on SLCPs - SNAP" and within the framework and funding of the Climate and Clean Air Coalition (CCAC), United Nations Environment Programme (UNEP), Ministry of Environment, 2017/2018.
21. ***Review, Prioritization and Monitoring of NDCs Implementation in Jordan*** within the International Climate Initiative "Policy dialogue and knowledge management on low emissions development strategies, in particular on renewable energies, in the MENA region" funded by GIZ 2016/2017.
22. ***Empowering Rural Women in the Jordan Valley / Piloting a Cultivation of Indigo-Bearing Crops in Ghor el Safi***, UNESCO, Jordan, currently in progress. 2014/2015, 2015/2016, and 2016/2018.
23. ***Ministry Strategy and Restructuring for the period 2016-2025*** for the Ministry of Agriculture at the Kingdom of Saudi Arabia, Jordan Society for Scientific Research on subcontract with PricewaterhouseCoopers (PwC), KSA, 2015.
24. ***Senior National Sustainable Land Management expert*** to support the Agricultural Resource Management Project Phase II (ARMP-II) PMU staff in their preparation of knowledge documents, Ministry of Agriculture, Jordan, 2015.
25. ***Agricultural Survey Study for Promotion of Soil and Irrigation Good Agricultural Practices in the Jordan Valley.*** Environmental Sustainability of Irrigated Agricultural Production in Lebanon and Jordan (ENSIAP), Istituto per la Cooperazione Universitaria Onlus (ICU), Jordan.
26. ***Survey for Wells' Contamination at Hussein Thermal Power Station (HTPS).*** Central Electricity Generation Company (CEGCO), Jordan, 2015.
27. ***Evaluation of medicinal use of clay minerals isolated from Jordan's clay soil,*** funded by the Scientific Research Support Fund, the Ministry of Higher Education, Amman, Jordan, 2014-2016.
28. ***Development of Interdisciplinary Programmes on Climate Change & Sustainability Policy*** (CLIMASP), Funded by TEMPUS and directed by the Hashemite University, 2014/2015.
29. ***Climate modelling and projection using historic and "Dynamic Downscaling" for Jordan***. Vulnerability and adaptation chapter of Third National Communication Report of Jordan to UNFCCC. IUCN West Asia Regional Office, UNDP, Jordan, 2014.
30. ***Developing Policy-Oriented Research Guidelines, Procedures, and Tools to Support Implementing Rio Conventions in Jordan***, UNDP, 2011.
31. ***Development of Adaptation Measures to Climate Change and Formulation of Needed Strategy Implementation Plan Relevant to Climate Change and IWRM for the Zarqa River Basin***, UNDP, 2010.
32. ***Investigating the Potential of Groundwater Pollution in Jordanian Vertisols using Contaminant Transport Models***, funded by the Deanship of Research, Hashemite University, Zarqa-Jordan, 2009.
33. ***Characterization of Soil Physical Properties within the Hashemite University Landscape***, funded by the Deanship of Research, Hashemite University, Zarqa, Jordan, 2005.
34. ***Assessing efficiency and upgrading the performance of the wastewater plant system at Hamoudeh Diary Farm***, 2006.
35. ***Jordan Valley Preliminary Land Use Master Plan Project***. Consolidated Consultants Engineering and Environment. Ministry of Water & Irrigation, Jordan Valley Authority, United States Agency For International Development (USAID), 2004.
36. ***Impact Assessment of Past Irrigation Practices on Soil Properties***. University of Jordan Centre for Consultation, GTZ, 1997.

WORKSHOPS FACILITATION AND MODERATION

1. ***Agriculture and Water Sector and Opportunities.*** Aseer Development Agency (ASDA), KSA, 2025.
2. ***The Perspective of Future Technologies for Soil Amendments***. Supported by NEOM, The Palladium Group, 23rd October 2022, Tabuk, KSA.
3. ***Climate Change Partners' Coordination Meeting***. Supported by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), NDC Partnership, and Ministry of Environment. 16th November 2020, Chemisty Business Center, Amman, Jordan.
4. ***Innovative Sanitation Solutions and Reuse in Arid Regions (ISSRAR), Launching Ceremony.*** Bremen Overseas Research and Development Association (BORDA), Swiss Agency for Development and Cooperation (SDC). Held on 7th February, 2019 at Fairmont Hotel Amman, Jordan.
5. ***Mainstreaming of the Ecosystem Services Approach and Networking among Universities of Jordan***. Ministry of Environment supported by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH(GIZ), on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), by implementing the project Sustainable Use of Ecosystem Services in Jordan (EKF-ESS). Hashemite University, Zarqa, Jordan, 17th August 2017.
6. ***The Second International Conference of "WASH and Construction"***. Swiss Agency for Development and Cooperation (SDC), Amman, Jordan, 14th-18th May 2017.
7. ***The Seventh Conference on Scientific Research in Jordan***. Middle East University, Amman, Jordan, October 2015.
8. ***The Regional Knowledge Network on Systemic Approaches to Water Resources Management project.*** The European Union, and directed by the International Union for Conservation of Nature and Natural Resources for West Asia –ROWA, 2014.
9. ***Social, Ecological and Agricultural Resilience in the Face of Climate Change Project (SEARCH)*** funded by European Union (EU) and directed by the International Union for Conservation of Nature and Natural Resources for West Asia –ROWA, 2014.
10. ***Assessment of Drought and Flood at Partners Countries of Sustainable Water Integrated Management (SWIM)***, European Union (EU), 2013/2014.
11. ***Water Integrity in the Middle East and North Africa*** as a part of the "Regional capacity building programme promoting and developing water governance and integrity in the MENA region for Arab countries" funded by the UNDP Water Governance Facility at SIWI (WGF) and directed by the International Union for Conservation of Nature and Natural Resources for West Asia –ROWA, 2014.
12. ***Josco Award and exhibition for Applied Scientific Research***. Jordan Company for oil shale initiative (JOSCO) in partnership with the Engineering Consultant Company, University, Zarqa, Jordan, October 2015.
13. ***The Sixth Conference on Scientific Research in Jordan***. Al-Zaytoonah University of Jordan, Amman, Jordan, Nov 2013.

ADVANCE TRAININGS TAUGHT

1. ***On-farm Fertilizers, Pesticides and Waste Management***. 17th of March 2021. Organized by the International Center for Biosaline Agriculture (ICBA) in partnership with the HSBC Bank and Smart Labour.
2. ***Preparing Organic Fertilizer from Agricultural Waste.*** 5th of March 2021. Organized by Jordan Agricultural Engineers Association, Amman, Jordan.
3. ***Regional Water Auditing***. 3rd of February 2021. Organized by FAO and IWMI under the framework of the SIDA funded regional project 'Implementing the 2030 Agenda for water efficiency/productivity, and water sustainability in NENA countries".
4. ***Characterizing and Assessing Research Quality for Scaling the Impact for Innovation and Development.*** 23rd January 2021, Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA), Amman, Jordan.
5. ***Modular Competency based Training Programs.*** 27-28 November 2020. Organized by Jordan Agriculture Engineers Association. Online, Amman, Jordan.
6. ***Engineering Applications of Geomatics' Training Course.*** 2nd to 13th September 2019. GEO4D Erasmus + Project, Politecnico di Milano, Lecco Campus, Italy.
7. ***BSAFE***. 19 August 2019. UNDSS.
8. ***E-learning and PBL (Problem Based Learning) pedagogy.*** 1st to 6th April 2019. GEO4D Erasmus + Project, University of Leon, Ponferrada, Spain.
9. ***GIS Training Course***. 18th to 29th June 2018. GEO4D Erasmus + Project, Politecnico di Milano, Lecco, Italy.
10. ***Curricular Development***. 19th to 23rd February 2018. GEO4D Erasmus + Project, University of Leon, Leon, Spain.
11. ***Managing Corruption Risks in Development Cooperation.*** March 2017, Swiss Agency for Development and Cooperation (SDC), Anti-Corruption Resource Centre, http://www.u4.no.
12. ***Sequestering National Adaptation Plan (NAP) Process.*** 27 February to 1 March 2017, Ministry of Environment in cooperation with GIZ, Jordan.
13. ***Advanced Security In The Field***. 22 October 2016, UNDSS.
14. ***Basic Security In The Field II***. 17 October 2016, UNDSS.
15. ***UNESCO Field Security Awareness Training 2012.***02/12/2016, UNESCO.
16. ***Capacity Building Program for the National Desertification, including reporting on strategic and operational objectives as well in the framework of the 10-Years Strategy of the UNCCD.*** IUCN West Asia Regional Office, 4-7 September 2014, Sharm Al Shaikh, Egypt
17. ***Understanding the Science of Environmental Governance and Building Capacity of Skills of Development of Environmental Polices and Strategies Related to Implementation of Rio convention in Jordan and Integration of Conventions' Provisions into National Development Planning***. February 2012, UNDP, Amman, Jordan.
18. ***Learning Management System, Virtual Class Room Class Capturing System, Authoring Tool***. 2011. E-Learning Center, 2011, Hashemite University, Zarqa, Jordan.
19. ***Building Online Course Using Blackboard***. E-Learning Center, 2004. Hashemite University, Zarqa, Jordan.
20. ***GIS Training Course*** – Arc/Info. 21st March to 1st April 1998. Jordan Arid Zone Productivity Project, University of Jordan, Amman.

PROFESSIONAL TRAININGS GIVEN

1. ***Quality Assurance and Quality Control (QA/QC) for Weather and Climate Data,*** Jordan Department of Meteorology (JMD), Amman, Jordan, 2022.
2. ***International Quality Assurance and Control (ISO-Based QA/QC) for Environmental and Analytical Data,*** International Plant Nutrition Institute (INPI), Irbid, Jordan, 2024.
3. ***Water, Energy, Food Production, and Ecosystem Health Management and Interactions in Aseer.*** Aseer Development Agency (ASDA), KSA, 23rd March 2025.
4. ***Land-Water-Plant Management through Advanced Climate-Smart Technologies with emphasis on Soil Amendments.*** 20-30 May 2023, The Palladium Group, NEOM, Tabuk, KSA.
5. ***Smart Irrigation.*** 12th May 2020, Jordan Agricultural Engineers Association, Amman, Jordan.
6. ***Managerial and Planning Skills for Technical Officials at DOAs.*** 22nd to 26th of October 2017, National Center for Agricultural Research and Extension (NCARE) funded by Japan International Cooperation Agency (JICA), Amman, Jordan.
7. ***Scientific Research from Basics to Application and Innovation.*** September 2017, Abdul Hameed Foundation-Arabic Bank, Amman, Jordan.
8. ***Preparation of International Contracts, Documentary Credits and Letter of Guarantee.*** September 2017. The Regional Centre on Agrarian Reform and Rural Development for the Near East (CARDNE) funded by Japan International Cooperation Agency (JICA), Amman, Jordan.
9. ***Training of Trainers Course on "Establishing and Strengthening Irrigation Water Users Associations".*** Canada funded project implemented by FAO with the technical support of PHG, 23rd to 27th April 2017, Amman, Jordan.
10. ***Impacts of Climate Change on Agriculture Sector and Food Security.*** November 2016. The Regional Centre on Agrarian Reform and Rural Development for the Near East (CARDNE) funded by Japan International Cooperation Agency (JICA), Amman, Jordan.
11. ***Drafting and Writing Projects and Raise External Funding.*** October 2016. The Regional Centre on Agrarian Reform and Rural Development for the Near East (CARDNE) funded by Japan International Cooperation Agency (JICA), Amman, Jordan.
12. ***Nexus: Agriculture, Energy, and Environment. Media Training Program for Journalists.*** June 2016. Broadcasting Board of Governors, Voice of America, Jordan Radio and Television Corp., Amman, Jordan.
13. ***Impacts of Climate Change on Food Security (Challenges and Opportunities).*** October 2015. The Regional Centre on Agrarian Reform and Rural Development for the Near East (CARDNE)funded by Japan International Cooperation Agency (JICA), Amman, Jordan.
14. ***Soil, Plant and Water Characteristic Important for Fertigation, Irrigation Scheduling for Open and Protected Agriculture, and Technology Transfer of Fertigation***, September 2015. International Plant Nutrition Institute (INPI), Irbid, Jordan.
15. ***Irrigation Management under Saline and Sodic Conditions*** September 2014. International Plant Nutrition Institute (INPI), Irbid, Jordan.
16. ***Irrigation Management at Farm Level.*** January 2014. Jordanian Association of Agricultural Engineers, Amman, Jordan.
17. ***Irrigation Management***. December 2013. Capacity Building through Training Modules for National Center for Agricultural Research and Extension (NCARE) Extension Agents & Staff. Held in the framework of the project ENSIAP - Improving the Environmental Sustainability of Irrigated Agricultural Production in Lebanon and Jordan. Istituto per la Cooperazione Universitaria Onlus (ICU), Jordan.
18. ***Plant Water Requirements***. September 2013. International Plant Nutrition Institute (INPI), Irbid, Jordan.
19. ***Arid Land Management& Climate Change.*** September 2013. International Plant Nutrition Institute, Irbid, Jordan.
20. ***Assessment of the Risks from Climate Change and Water Scarcity on Food Productivity***. 2012. FAO. Science Triangle for Research, Training and Management (STRTM).
21. ***Soil-Plant-Water Relationship, Evapotranspiration, Irrigation Scheduling and Estimation of Consumptive Use***. 2012. International Plant Nutrition Institute (INPI), Irbid, Jordan.
22. ***IWRM as an Adaptive System for Agricultural Production.***2012. UNESCO, Amman, Jordan.

23. ***Climate Change***. 2012. Jordanian Association of Agricultural Engineers, Amman, Jordan.
24. ***Micro-Irrigation Design Computer Applications.*** 2011. International Plant Nutrition Institute (INPI), Irbid, Jordan.
25. ***Advanced Irrigation Design***. 2010. Arabic Organization for Agriculture Development, Amman, Jordan.
26. ***Training in Soil Science for Ministry of Education***. 2010. Centre for Studies, Consultation and Community Services (CSCCS), Hashemite University, Zarqa, Jordan.
27. ***Methods of Irrigation: Open and Pressurized***. 2010. International Plant Nutrition Institute (INPI), Irbid, Jordan.
28. ***Evapotranspiration and Crop Coefficients.*** 2010. International Plant Nutrition Institute (INPI), Irbid, Jordan.
29. ***Irrigation Scheduling.*** 2010. International Plant Nutrition Institute (INPI), Irbid, Jordan.
30. ***Methods of irrigation: Open and pressurized***. 2009. International Plant Nutrition Institute (INPI), Irbid, Jordan.
31. ***Evapotranspiration and crop coefficients***. 2009. International Plant Nutrition Institute (INPI), Irbid, Jordan.
32. ***Irrigation Scheduling***. 2009. International Plant Nutrition Institute (INPI), Irbid, Jordan.
33. ***Soil Physical Characterization for Irrigation Design***. 2008. Fertigation and Irrigation. Technology Workshop, International Plant Nutrition Institute (INPI), Irbid, Jordan.
34. ***Estimation of Plant Water Consumptive Requirements***. 2008. Fertigation and Irrigation. Technology Workshop, International Plant Nutrition Institute (INPI), Irbid, Jordan.
35. ***Monitoring of Soil Water Plant System***. 2008. Fertigation and Irrigation. Technology Workshop, International Plant Nutrition Institute (INPI), Irbid, Jordan.
36. ***Irrigation Systems Efficiencies Control***. 2008. Fertigation and Irrigation Technology Workshop, International Plant Nutrition Institute (INPI), Irbid, Jordan**.**

ATTENDED CONFERENCES & WORKSHOPS

1. ***Jordanian Youth Climate Conference***. 7-8 August 2021. Green Generation Foundation, Liwan Youth Space, Amman, Jordan. Presenting the "***Modeling and expected impacts on climate change***".
2. ***The Supervisory Role of Private Desalination Plants between the Standard and Reality.*** 18th March 2021, Jordan Agricultural Engineers Association, Amman, Jordan.
3. ***Renewables Readiness Assessment (RRA) Jordan***, 22 February 2021, organized by the International Renewable Energy Agency (IRENA) in partnership with the Ministry of Energy and Mineral Resources (MEMR).
4. ***Nexus - Energy Security***, within the context of the development of the National Environment Strategy 2030. 26 November 2020. Amman, Jordan.
5. ***Strategic Thinking with Scenarios: Using Scenario Planning Techniques for Understanding the Cause-Effect Relationship of Complex Systems***. 23- 26 November 2020. UNDP, Aqaba City, Jordan.
6. ***Organic Farming in Jordan.*** 14th November 2021, Jordan Agricultural Engineers Association, Amman, Jordan.
7. ***Climate Change and its Impact on Biodiversity.*** 12th November 2021, Jordan Agricultural Engineers Association, Amman, Jordan.
8. ***The Debate on Future Strategies to cope with Agricultural Water Scarcity and Climate Change.*** 5th November 2020. The Islamic World Academy of Sciences (IAS) and Association of Agricultural Research Institutions in the Near East & North Africa (AARINENA).
9. ***The publishing landscape in the Arab World***. 22 June, 2020. Researcher Academy On Campus. at AARU, Elsevier.
10. ***Airborne LiDAR Practical Applications.*** 8th March 2020. GEO4D Co-funded project, Erasmus +, Eurpean Union, The Hashemite University, Zarqa, Jordan.
11. ***Project for the preparation of the fourth national communications report and the second emission update. Project launch ceremony.*** 5th August 2019, Ministry of Environment and funded by UNDP and GEF, Amman, Jordan.

12. ***Building Capacity for International University Cooperation and Research Collaboration.*** 24-26 June 2019. International Conference and Workshop, U.S.- Jordanian University Cooperation Network (UCN), University of Jordan, Amman, Jordan.
13. ***National High Level Workshop for Supporting National Action and Planning on Short-Lived Climate Pollutants SNAP on (SLCPs) project***. 18th April 2019. Grand Hayat Hotel, UNEP, Ministry of Environment, Amman, Jordan.
14. ***First National Conference on Environment and Development in Jordan.*** 6-7 November 2018. GEF, UNDP, GoALWaSH, UNDP, Amman, Jordan.
15. ***The Eighth Scientific Agricultural Conference (ESAC).*** 15-17th October 2018. Mutah University, Karak, Jordan.
16. ***NAP Communication Plan Focus Group meeting.*** 11th October 2018. GIZ, Amman, Jordan.
17. ***First Jordanian International Agricultural Forum and Exhibition***. 25thApril 2018. King Hussein Bin Talal Convention Center, Dead Sea, Jordan.
18. ***Outline and Scope of the NAP Document for Jordan.*** Stakeholders' Consultation Workshop. (26th to 27th March 2018). Ministry of Environment in cooperation with GIZ, Movenpick Hotel, Dead Sea, Jordan.
19. ***Jordan Water Day*** (20th March 2018). Department of Water Management and Environment, Faculty of Natural Resources and Environment, The Hashemite University, Zarqa Jordan
20. ***Jordan Forest Week.***14th March 2018. Organized by the Alliance of Forests Societies and the Hashemite University, The Hashemite University, Zarqa Jordan.
21. ***Jordan Zero Hunger Strategic Review***. Stakeholders' Consultation Workshop. 8th February 2018. World Food Programme (WFP) in corporation with Higher Council for Science and Technology, Amman, Jordan.
22. ***Enhancing the Capacities for Disaster Risks Reduction and for National Crisis Management Including the Coordination of International Response in Jordan*** (December 2017 – May 2019). 5th February 2018. Twinning Project "Towards a Resilient Society" between Ministry of Planning and International Cooperation of the Hashemite Kingdom of Jordan and the Administration of the Republic of France (Ministry of Interior – General Directorate for Civil Protection and Crises Management) and the final recipient of the action in Jordan Civil Defence General Directorate, Amman, Jordan.
23. ***National Adaptation Planning in Jordan: Current Situation and Future Areas of GIZ Support***. 29th August 2017, Ministry of Environment in cooperation with the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), Amman, Jordan.
24. ***NAP Training and Stocktaking Workshop for the National Adaptation Plan (NAP) Process in Jordan.*** 27thFebruary to 1stMarch 2017, Ministry of Environment in cooperation with the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH(GIZ), Dead Sea, Jordan.
25. ***National Workshop on NDCs Review and Implementation: Prioritizes and Future Steps. February*** 7th 2017. GIZ, Ministry of Environment, Amman, Jordan.
26. ***Setting National Land Degradation Neutrality Targets for Jordan, Inception Workshop.*** January 19th 2017, Ministry of Environment, Amman, Jordan.
27. ***Climate Change Technology Needs Assessment (TNA), National Workshop no. IV (TAPs Development).*** 18-19 December, 2016, AlMakan, Ministry of Env., UNEP DTU, Dead Sea, Jordan.
28. ***Jordan NDCs review and prioritization and the Climate Action Road After COP 22.*** November 28th, 2016. GIZ, Ministry of Environment, Amman, Jordan.
29. ***Climate Change COP22: Jordan's investment and private sector opportunities.*** October 27th, 2016. EDAMA, GIZ, Amman, Jordan.
30. ***From Paris to Marrakech: Expectations from COP 22 and Jordanian Perspectives***. 9th October 2016. Ministry of Environment, GIZ, Amman, Jordan.
31. ***Yarmouk River Hydropolitical Baseline***. 28th May 2016. Swiss Development. Swiss Development Corporation, Water Security Research Centre / School of International Development at the University of East Anglia. Amman, Jordan.
32. ***Climate Change Technology Needs Assessment (TNA),*** National Workshop no. III (Barrier Analyses and Enabling Framework). 10-11 May, 2016, AlMakan, Ministry of Env., UNEP DTU, Dead Sea, Jordan.
33. ***Rio Conventions in the Development Sectors Project – (RIO).*** Consultive Workshop with National Rio Committees' Members. 20th April 2016. Ministry of Env., GEF, UNDP.

34. ***Climate Change and Paris Agreement "From Paris to Amman"***, 15th Feb. 2016, UNDP, MoEnv, Amman, Jordan.
35. ***INDCs Implementation in Jordan and the Post Paris Roadmap***. 9th Feb. 2016, GIZ, Amman, Jordan.
36. ***Climate Change Technology Need Assessment (TNA) Project***. 17th November 2015. Ministry of Environment, UNEP DTU Partnership, AlMakan, Amman, Jordan.
37. ***Quality Assurance Standards Guide for Agriculture Science Program***. January 2016. Higher Education Accreditation Commission, Amman, Jordan.
38. ***Predicting Future Climate Change at the Hashemite Kingdom of Jordan***. Within Conference titled "Climate Change: Status and Challenges". Jordanian Agriculture Engineering Association, Amman, Jordan, 2/9/2015.
39. ***Jordanian Experience with Climate Change Studies***, within MAPEC annual workshop, University of Jordan, Amman, Jordan, 1/9/2015.
40. ***National Conference for National Master Plan to Rehabilitate the Jordan River Valley***. 9th May, 2015. Ministry of Water and Irrigation, Royal Haskoning DHV, EcoPeace Middle East, SIWI, GNF, EU. Crown Plaza Hotel, Dead Sea, Jordan.
41. Dynamic Downscaling of climate change scenarios for Jordan, within ***Workshop on Development Of Statistical Downscaling of Climate Change Scenarios***, Corp Executive Hotel, Amman, Jordan, 14-16/12/2014.
42. ***Workshop for Advisory Studies to update the national strategy and action plan to combat desertification and the update of the national strategy and the action plan for biodiversity in Jordan.*** Including the preparation of the Fifth National Report (2014) of the United Nations Convention on biodiversity (UNCBD), and Preparation of Fourth National Report (2012) and Fifth National Report (2014) of the United Nations Convention to Combat Desertification (UNCCD). 14th of August, 2014. Ministry of Environment, Amman, Jordan.
43. ***Third National Communication Project "Vulnerability and Adaptation" Chapter, Results Dissemination Workshop.*** June 2014, Ministry of Environment, Amman, Jordan.
44. ***Third National Communication Project "GHG Inventory", Results Dissemination Workshop.*** August 2013, Ministry of Environment, Amman, Jordan.
45. A workshop to present the results of a public opinion titled "***Measuring knowledge of climate in Jordan***". Ministry of Environment in cooperation with Royal Scientific Society and UNDP, September 2013, Amman, Jordan.
46. The launch workshop for "***National Climate Change Policy for the Hashemite Kingdom of Jordan***". Ministry of Environment in cooperation with National Energy Research Center and UNDP, May 2013, Amman, Jordan.
47. ***Climate Change Impacts on Ecosystems Biodiversity.*** The Royal Society for Conservation of Nature. February 2013, Amman, Jordan.
48. ***The integrated Ecosystem Management in the Jordan Rift Valley Project***, 2012, RSCN, Amman, Jordan.
49. ***Developing a National Climate Change Policy for the Hashemite Kingdom of Jordan***, Developing Policy-relevant Capacity for Implementation of the Global Environmental Conventions in Jordan "CB2" Project, November 2012, UNDP, Amman, Jordan.
50. ***Enabling Activities for the Preparation of Jordan's 3rd National Communication Report to UNFCCC***, 2012, UNDP, Amman, Jordan.
51. ***Protoype Display Workshop for CB-2 Project's Virtual Platform and Jordan Environmental Information System (JEIS)***, 2012, UNDP, Amman, Jordan.
52. ***Developing Policy-Oriented Research Guidelines, Procedures, and Tools to Support Implementing Rio Conventions in Jordan***, 2012, FAO, Amman, Jordan.
53. ***Strategy of Adaptation of Biodiversity to Climate Change in Jordan***, 2012, RSCN, Amman, Jordan.
54. ***Assessment of the risks from Climate Change and Water Scarcity on Food Productivity***. 2012, FAO, Amman, Jordan.
55. ***Development of Adaptation Measures to Climate Change and Formulation of Needed Strategy Implementation Plan Relevant to Climate Change and IWRM for the Zarqa River Basin***, 2011, UNDP, Amman, Jordan.

Preparatory and Scientific Organizing Committees for Conferences and Workshops

1. Preparatory Committee Member of the Scientific Day titled "***The Mainstreaming of the Ecosystem Services Approach and Networking among Universities of Jordan***", 17th August 2017, Ministry of Environment, supported by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), Hosted at the Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
2. Preparatory Committee Member of the Scientific Day for the Faculty of Natural Resources and Environment titled "***GIS and RS Applications in Natural Resources Management***", 13 April 2017, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
3. Preparatory Committee Member of the Seventh Scientific Day for the Faculty of Natural Resources and Environment titled "***Petroleum Resources in Jordan***", 9thApril 2013, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
4. Preparatory Committee Member of the Sixth Scientific Day for the Faculty of Natural Resources and Environment titled "***Climate Change in Jordan and its impacts on Human and Environment***", 24-25thMarch 2012, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
5. Preparatory Committee Member of the conference "***Fifteenth World Conference of Vulcanospeleogy***", 15thMarch 2012, Center for Environmental Studies (CES), Hashemite University, Zarqa, Jordan.
6. Scientific Evaluation Committee Member of "***The Second Zarqa Scientific Engineering***" Workshop, 24-25 November 2010, Engineering Association, Private Zarqa University, Zarqa, Jordan.
7. Preparatory Committee Member of the Fifth Scientific Day for the Faculty of Natural Resources and Environment titled "***Recycling in Jordan: a National Need***", 14-15 April 2009, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
8. Preparatory Committee Member of the Workshop "***Jojoba Trees-The Golden Green***", 26 October 2008, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
9. Preparatory Committee Member of the Fourth Scientific Day for the Faculty of Natural Resources and Environment titled "***Sustaining and Developing Water Resources in Jordan***", 22 April 2008, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
10. Preparatory Committee Member of the Third Scientific Day for the Faculty of Natural Resources and Environment titled "***The GIS Role in Planning Cities and Land Use***", 11-13 December 2007, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
11. Preparatory Committee Member of the Workshop "***Renewable Energy in Jordan***", 8-12 May 2007, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
12. Preparatory Committee Member of the Workshop "***The 6th Agricultural Scientific Conference***", 9-12 April 2007, Faculty of Agricultural, University of Jordan, Amman, Jordan.
13. Preparatory Committee Member of the Workshop "***Environment and Sustainable Development***", May 24th 2006, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
14. Preparatory Committee Member of the Second Scientific Day for the Faculty of Natural Resources and Environment titled "***The Role of Environmental Geological Sciences in Sustaining the Economy of Jordan***", 3-5 December 2006, Hashemite University, Zarqa, Jordan.
15. Preparatory Committee Member of the Workshop "***The Energy in Jordan, Current and Future***", 1 November 2005, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
16. Preparatory Committee Member of the 5th Agricultural Scientific Conference, (12 – 15) May 2005, Under the theme: "***Towards Sustainable Agriculture in the Arabic World***", The Faculty of Agricultural Technology, At Al-Balqa' Applied University, Al-Salt, Jordan.
17. Preparatory Committee Member of the "***Environmental Week***", 3-6 May 2004, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.

PUBLICATIONS

1. Mohammed A. Tabieh, Emad K. Al-Karablieh, Amer Z. Salman, Tala Qtaishat, Nael Thaher, Mohammed Al-Qinna, Nehaya Al-Karablieh, Madi Al-Jaghbir, Khaleda Al-Ghazawi, Haitham Aladaileh, Ahmad Jamrah. ***An Economic Assessment of Fresh Water Reallocation by Treated Wastewater for Irrigation in Northern Jordan Valley***. 2024. Preprints Organization. doi: 10.20944/preprints202408.1260.v2(An Economic Assessment of Fresh Water Reallocation by Treated Wastewater for Irrigation in Northern Jordan Valley[v2] | Preprints.org)
2. Al-Qawasmi, O., Alrousan, D., Al-Qinna, M., and Masad, M. 2025. Exposure effect of magnetic field on olive mill wastewater properties. Int. J. Environ. Sci. Technol. https://doi.org/10.1007/s13762-024-05756-9
3. Hasan Salem Alkhaza'leh, Ahmad Moh'd Abu-Awwad, and Mohammed Ibrahim Al-Qinna. 2023. ***Effect of Irrigation with Treated Wastewater on Squash Yields, Soil Chemical and Microbial Properties***. Jordan Journal of Agricultural Sciences, Volume 19, No. 2, 2023, DOI: https://doi.org/10.35516/jjas.v19i2.164.
4. Ibrahim Al-Hasani, Mohammed Al-Qinna, and Nezar Atalla Hammouri. 2023. ***Potential Impacts of Climate Change on Surface Water Resources in Arid Regions Using Downscaled Regional Circulation Model and Soil Water Assessment Tool, A Case Study of Amman-Zerqa Basin, Jordan***. Climate 2023, 11, 51. https://doi.org/10.3390/cli11030051
5. Nabeel Bani Hani, Fakher J. Aukour, and Mohammed I. Al-Qinna. 2022. ***Investigating the Pearl Millet (Pennisetum glaucum) as a Climate-Smart Drought-Tolerant Crop under Jordanian Arid Environments***. Sustainability 2022, 14, 12249. https://doi.org/10.3390/ su141912249.
6. Mashal, K.; Ali, Y.; Al-Qinna, M.; Salahat, M.; Al-Degs, Y.S. 2022. ***Spatial distribution of sulfur accumulation in urban dust and its societal implications in Al Hashemiya, Jordan*****.** Environmental Quality Management, 31(3): 79-87. DOI: 10.1002/tqem.21755.
7. Jawad Al-Bakri, Ibrahim Farhan, Mohammed Al-Qinna, Emad Al-Karablieh, Karim Bergouli, Rachael McDonnell. 2021. ***Assessment of Climate Changes and Their Impact on Barley Yield in Mediterranean Environment Using NEX-GDDP Downscaled GCMs and DSSAT***. Earth Systems and Environment, Springer. Accepted: 11 June 2021, Published online 16 June 2021, https://doi.org/10.1007/s41748-021-00238-1
8. Ayat Al Qudah, Munir J. Rusan, Mohammed I. Al-Qinna, and Fayez A. Abdulla. 2021. ***Climate change vulnerability assessment for selected agricultural responses at Yarmouk River Basin Area, Jordan***. Mitigation and Adaptation Strategies for Global Change, (2021) 26:3. https://doi.org/10.1007/s11027-021-09944-7
9. Qtaishat, T. H., AlAdaileh, H., El-Habbab, M. S., Al-Qinna, M., and Emad K. Al-Karablieh. 2019. ***Drought Management Policies and Institutional Mandate in Jordan.*** 1st International Conference on Sustainable Energy-Water-Environment Nexus in Desert Climate – QEERI, December 2019.
10. Haitham AlAdaileh, Mohammed Al-Qinna, Károly Barta, Emad Al-Karablieh, János Rakonczai, Adel Alobeiaat. 2019. ***A Drought Adaptation Management System for Groundwater Resources Based on Combined Drought Index and Vulnerability Analysis.*** Earth Systems and Environment, 3:445–461. https://doi.org/10.1007/s41748-019-00118-9
11. Haitham AlAdaileh, Mohammed Al-Qinna, Károly Barta, Emad Al-Karablieh, Jawad Al Bakri, János Rakonczai. 2019. ***Applicability of a Combined Drought Index to Monitoring Drought in Jordan.*** Journal of Engineering Research and Application, 9(7) (Series -VI) July 2019, pp 20-39. DOI: 10.9790/9622- 0907062039.
12. Haitham AlAdaileh, Mohammed Al-Qinna, Barta Karoly, Emad Al-Karablieh and János Rakonczai. 2019. ***An Investigation into the Spatial and Temporal Variability of the Meteorological Drought in Jordan.*** Climate 2019, 7(82): 1-25; doi:10.3390/cli7060082
13. Jafar S.A. Abu-Rajab, Ali R.A. El-Naqa, Mohammed I. Al-Qinna. 2018. ***Hydrogeophysical characterization of shallow LNAPL contamination at a karst aquifer.*** Near Surface Geophysics, 16: 643-662. Doi: 10.1002/nsg.12021

14. Jwan H. Ibbini, Mohammed I. Al-Qinna, Kholoud Y. Mashal, Jamila Abuidhail, Karem H. Alzoubi and Majed M. Masadeh. 2018. ***Are Clay Minerals in Jordanian Soils Antibacterial?*** Jordan Journal of Earth and Environmental Sciences (JJEES), 9(2): 108-115.
15. Mohammed I. Al-Qinna. 2018. ***Analyses of Climate Variability in Jordan using Topographic Auxiliary Variables by the Cokriging Technique.*** Jordan Journal of Earth and Environmental Sciences (JJEES), 9(1):67-74.
16. Kholoud Mashal, Mohammed Al-Qinna, Mohammed Salahat, and Yahya Ali. 2017. ***Assessment of Heavy Metals in Urban Areas of Al-Hashmiyya City of Jordan.*** Jordan Journal of Earth and Environmental Sciences (JJEES), 8(2):61-67.
17. Al-Qinna, Mohammed I. and Salahat, Mohammed Ali. 2017. ***Investigating Agricultural Management Practices and Environmental Sustainability in Jordan.*** *Journal of Environmental Sustainability*: Vol. 5, Issue 1, Article 1.
18. Salahuddin M. Jaber and Mohammed I. Al-Qinna. 2017. ***TM-Based SOC Models Augmented by Auxiliary Data for Carbon Crediting Programs in Semi-Arid Environments.*** Journal of Photogrammetric Engineering and Remote Sensing, 83(6): 447-457
19. Mohammed A. Salahat, Mohammed I. Al-Qinna, Raed A. Badran. 2017. ***Potential of treated wastewater usage for adaptation to climate change: Jordan as a success story.*** Water Resources in Arid Areas: The Way Forward pp 383-405.
20. Taiseer Aljazzar, and Mohammed Al-Qinna. 2016. ***Assessment of nitrate transport parameters using the advection-diffusion cell***. Environ Sci. Pollut Res., 23(22):23145–23157. DOI 10.1007/s11356-016-7457-8.
21. Mohammed Salahat, Al-Qinna Mohammed. March 2016. ***Potential of treated wastewater usage for adaptation to climate change: Jordan as a success story***. International Water Conference on Water Resource in Arid areas: The Way Forward. Sultan Qaboos University, Muscat, Oman.
22. Nezar Hammouri, Mohammad Al-Qinna, Mohammad Salahat, Jan Adaoweski, Parsher Frisher. ***Community based adaptation options for climate change impacts on water resources: The case of Jordan***. Journal of Water and Land Development, 2015, No. 26 (VII–IX): 3–17, JWLD-00010-2015-02.
23. Mohammed Salahat, Al-Qinna Mohammed. 2015. ***Rainfall fluctuation for exploring desertification and climate change: new aridity classification*.** Jordan Journal of Earth and Environmental Sciences (JJEES), 7(1):27-35.
24. Salahuddin M. Jaber and Mohammed I. Al-Qinna. 2015. ***Global and local modelling of surface soil organic carbon using Thematic Mapper data in a semi-arid environment.*** Arabian Journal of Geosciences, 8:3159-3169, DOI 10.1007/s12517-014-1370-6.
25. Kholoud Mashal, Mohammed Salahat, Mohammed Al-Qinna, Yahya Al-Degs. 2015. ***Spatial distribution of cadmium concentrations in street dust in an arid environment***. Arabian Journal of Geosciences. 8(5):3171-3182, DOI: 10.1007/s12517-014-1367-1
26. Al-Qinna Mohammed, Scott H. Don, Brye Kristofor R., Van Brahana John, Sauer Thomas J., Sharpley, Andrew. 2014. ***Coarse Fragments Affect Soil Properties in a Mantled-Karst Landscape of the Ozark Highlands***. Soil Science. January 2014, 179(1):42–50, DOI: 10.1097/SS.0000000000000034
27. Mohammed Salahat, Mohammed Al-Qinna, Kholoud Mashal, Nezar A. Hammouri. 2014. ***Identifying major factors controlling groundwater quality in semiarid area using advanced statistical techniques***. Journal of Water Resources Management, 28(11):3829-3841. DOI 10.1007/s11269-014-0712-1.
28. Mustafa Al Kuisi, Kholoud Mashal, Mohammed Al-Qinna, Abdallah Abu Hamad, Armin Margana. 2014. ***Groundwater Vulnerability and Hazard Mapping in an Arid Region: Case Study, Amman-Zarqa Basin (AZB)-Jordan***. Journal of Water Resource and Protection, 2014(6): 297-318. http://dx.doi.org/10.4236/jwarp.2014.64033
29. Abeer Salman, Mohammed Al-Qinna, Mustafa Al-Kuisi. 2014. ***Spatial Analysis of Soil and Shallow Groundwater Physicochemical Parameters in El-Mujib Basin-Central Jordan***. Journal of Asian Earth Sciences 79 (2014):366-381. DOI information: 10.1016/j.jseaes.2013.10.008.
30. Kholoud Mashal, Yahya S. Al-Degs, Mohammed Al-Qinna, Mohammed Salahat. 2014. ***Elucidation of Phosphorous Sorption by Calcareous Soils using Principal Component Analysis***. Journal of Chemistry and Ecology. 30(2):133-146. Taylor & Francis Online. DOI:10.1080/02757540.2013.841895.

31. Mohammed I. Al-Qinna, Mohammed Salahat, Kholoud Mashal. 2014. ***Solute Transport as Affected by Surface Land Characteristics in Gravely Calcareous Arid Soils.*** Arabian Journal of Geosciences. 7(5):1965-1972. (DOI) 10.1007/s12517-013-0949-7.

32. Mohammed Al-Omari, Mohammed Al-Qinna, Amer Shareef. 2013. ***The future of Agricultural Education in Jordan***. Presented at the National Agriculture Conference entitled **"Chances and Chalenges"**, July 2013,Amman, Jordan.

33. Mohammed I. Al-Qinna and Salahuddin M. Jaber. 2013. ***Predicting Soil Bulk Density Using Advanced Pedo-Transfer Functions in an Arid Environment***. Transactions of the ASABE, 56(3): 963-976.

34. Salahuddin M. Jaber and Mohammed I. Al-Qinna. 2011. ***Soil Organic Carbon Modeling and Mapping in a Semi-Arid Environment Using Thematic Mapper Data.*** Photogrammetric engineering and remote sensing, 77(7): 709-719.

35. Salahuddin M. Jaber, Christopher L. Lant, and Mohammed I. Al-Qinna. 2011. ***Estimating spatial variations in soil organic carbon using satellite hyperspectral data and map algebra.*** International Journal of Remote Sensing, 32(18): 5077-5103.

36. Kholoud Mashal, Mohammed Al-Qinna, JwanIbbini. 2011. ***Phosphorus-Sorption Characteristics of Calcareous Soils in Arid and Semi Arid Regions.*** Int. J. of Sustainable Water and Environmental Systems 3(1):53-58. Presented at the International Conference on Energy, Water, and Environment (ICEWE 2010), Amman, Jordan.

37. Mohammed I. Al-Qinna, Nezar A. Hammouri, Mutewekil M. Obeidat, Fayez Y. Ahmad. 2011. ***Drought Analysis in Jordan under Current and Future Climates.*** Journal of Climatic Change, 106(3):421-440.

38. Mohammed I. Al-Qinna. 2010.***The Main Structure and Land Use in Plant-Agricultural Holdings*.** Analysis Results of the Agricultural Census, 2007, Department of Statistics.

39. Abeer Salman, Khalil M. Ibrahim, Ghazi Saffarini, and Mohammad Al-Qinna. 2009. ***Geostatistical Calculation for Clay Reserve in Azraq Basin in Jordan.*** Journal of Geography and Regional Planning, 2(5):144-153.

40. Mustafa Al Kuisi and Mohammed I. Al-Qinna. 2009. ***Spatial Assessment of Salinity and Nitrate Pollution in Amman-Zarqa Basin: A Case Study.*** Journal of Environmental Earth Sciences, 59(1):117-129.

41. Kholoud Mashal, Mohammed Al-Qinna, and Yahya Ali. 2009. ***Spatial Distribution and Environmental Implications of Lead and Zinc in Urban Soils and Street Dusts Samples in Al-Hashimeyeh Municipality.*** Jordan Journal of Mechanical and Industrial Engineering, 3(2): 141-150.

42. Mohammed I. Al-Qinna, Mohammed A. Salahat, and Ziad N. Shatnawi. 2008. ***Effect of Carbonates and Gravel Contents on Hydraulic Properties in Gravely-Calcareous Soils.*** Dirasat, Agricultural Sciences, 35(3):145-158.

43. Fakher J. Aukour and Mohammed I. Al-Qinna, 2008. ***Marble Production and Environmental Constrains: Case Study from Zarqa Governate in Jordan.*** Jordan Journal of Earth and Environmental Sciences (JJEES), 1(1):11-21.

44. Mohammed I. Al-Qinna. 2005. ***Potential of Groundwater Contamination of Karstic Aquifer: A Case Study.*** Proceeding of the workshop of Aquifer Vulnerability & Risk in Jordan, UNESCO, Hashemite University, Zarqa, Jordan, 158-212.

45. M. Al-Qinna, H.D. Scott and V. Brahana, 2005.***Characterization of Solute Transport in Pedons within Mantled Karst Landscape.*** The 5th Agricultural Scientific Conference, (12 – 15) May 2005, Under the theme: "*Towards Sustainable Agriculture in the Arabic World*", The Faculty of Agricultural Technology, At Al-Balqa' Applied University, Al-Salt, Jordan.

46. Brahana, J.V., TiongEe Ting, Mohammed Al-Qinna, John F. Murdoch, Ralph K. Davis, JozefLaincz, Jonathan J. Killingbeck, Eva Szilvagyi, Margaret Doheny-Skubic, IndrajeetChaubey, P.D. Hays, and Gregg Thoma. 2005. ***Quantification of Hydrologic Budget Parameters for the Vadose Zone and Epikarst in Mantled Karst.*** U.S. Geological Survey Karst Interest Group Proceeding, Rapid City, South Dakota, USA, 144-152.

47. Brahana, J.V., Davis, R.K., Sauer, T.J., Ting, TiongEe, Al-Rashidy, Said, Whitsett, Kelly, and Al-Qinna, Mohammed, 2002, ***Recurring, multicomponent ground-water tracing experiments at a well characterized basin in mantled karst--Lessons from the Savoy Experimental Watershed.*** Geological Society of America, Paper Number 69-14, Abstracts with Programs, v. 34, no. 6, p. 158-159, Denver Annual Meeting (October 27-30, 2002).

48. M. Al-Qinna, A. Mauromoustakos, and H.D. Scott. 2002. ***Use of JMP Version 5 for Teaching and Research of Applied Stat/Math Methods in Life Sciences.*** Annual Meetings Abstracts. ASA-CSSA-SSSA. Indianapolis, USA.

49. Mohammed Qinna and A.M. Abu-Awwad. 2001. ***Wetting Patterns under Trickle Source in Arid Soils with Surface Crust.*** J of Agriculture Engineering Research. 80(3):301-305.

50. Mohammed Qinna and A.M. Abu-Awwad. 1998. ***Soil Water Storage and Surface Runoff as Affected by Irrigation Methods in Arid Soils with Surface Crust.*** Agricultural Water Management Journal, 37(3):189-203.

51. Mohammed Qinna and A.M. Abu-Awwad. 1998. ***Infiltration Rate Measurements in Arid Soils with Surface Crust.*** Irrigation Science. 18: 83-89.

BOOKS' AUTHOR AND COAUTHER

1. Mohammed I. AL-Qinna. Data Mining**,** developed for the *GEO4D Master Program in Geodesy and Land Management*, Erasmus+ 2021.
2. Mohammed Al-Qinna. ***Geospatial Strategy for Ministry of Environment, Water, and Agriculture***, Ministry of Environment, Water, and Agriculture, Riyadh, KSA.
3. Mohammed Al-Qinna. ***Soil Amending Manual***. NEOM, KSA.
4. Mohammed Al-Qinna. ***Jordans' Fourth National Communication on Climate Change***. July 2023. Submitted to UNFCCC, MoEnv, Funded by UNDP, Amman, Jordan.
5. Mohammed Al-Qinna. April 2022. ***National Climate Change Policy of The Hashemite Kingdom Jordan 2022-2050***. MoEnv, Funded by UNDP, Amman, Jordan.
6. Mohammed Al-Qinna. April 2017. Training Manual in ***Establishing and Strengthening Irrigation Water Users Associations.*** Part of the Canada funded project: "Support economic growth through optimized agricultural value chains in the West Bank" implemented by FAO with the technical support of PHG, Amman, Jordan.
7. Mohammed Al-Qinna. October 2016. Training Manual in ***Drafting and Writing Projects and Raise External Funding.*** Third Country Training Programme (TCTP), Capacity Development for Agriculture and Rural Development in the Republic of IRAQ, Extension of Modern Agriculture Technology in Iraq, Ministry of Agriculture, Republic of IRAQ, CARDNE and JICA, Amman, Jordan.
8. Mohammed Al-Qinna. October 2015. Training Manual in ***Impacts of Climate Change on Food Security (Challenges and Opportunities).*** Third Country Training Programme (TCTP), Capacity Development for Agriculture and Rural Development in the Republic of IRAQ, Extension of Modern Agriculture Technology in Iraq, Ministry of Agriculture, Republic of IRAQ, CARDNE and JICA, Amman, Jordan.
9. Mohammad Al Qinna, Downscaling and Climate Projections at the Vulnerability and Adaptation chapter within the ***Jordan's Third National Communication on Climate Change*** (2014). Submitted to The United Nations Framework Convention on Climate Change (UNFCCC). The Hashemite Kingdom of Jordan the Deposit Number at the National Library (2014/11/5178). Ministry of Environment and United Nations Development Programme, Amman, Jordan.
10. Mohammad Al Qinna, Climate Change component expert within ***Policy-oriented National Priority Research Topics in Climate Change, Biodiversity, and Combating Desertification (2013-2020) with Guidelines, Procedures, Tools and Potential Funding Sources to Support their Implementation in the Hashemite Kingdome of Jordan.*** A Knowledge Product of "Developing Policy-relevant Capacity for Implementation of the Global Environmental Conventions in Jordan" "The CB-2 Project" February 2013. The Hashemite Kingdom of Jordan the Deposit Number at the National Library (2013/2/466). Ministry of Environment and United Nations Development Programme, Amman, Jordan.
11. Mohammed Al-Qinna. December 2013. Training Manual in ***Irrigation Management***. Capacity Building through Training Modules For NCARE Extension Agents & Staff. Held in the framework of the project ENSIAP - Improving the Environmental Sustainability of Irrigated Agricultural Production in Lebanon and Jordan. Istituto per la Cooperazione Universitaria Onlus (ICU), Jordan.

12. Mohammed Al-Qinna, Climate Change component expert within ***Adaptation to Climate Change in The Zarqa River basin: Development of policy options for adaptation to Climate Change and Integrated water resources management (IWRM)***. December, 2012. Ministry of Environment and United Nations Development Programme, Amman, Jordan.
13. Abu-Awwad and Mohammed Al-Qinna. 2001. ***Soil and Irrigation Laboratory Manual***. High School Textbook for Agriculture Sector. Ministry of Education, Amman, Jordan.

Journal Reviewing & Evaluation Experience

1. Assistant Editor of the Jordan Journal of Earth and Environmental Sciences (JJEES)
2. Peer reviewer for the following Journals:
   - Soil Science Society of America
   - Soil Research
   - Journal of Arid Environments
   - Arabian Journal of Geosciences
   - Journal of Applied Sciences
   - Journal of Atmosphere
   - Journal of Hydrology and Earth System Sciences
   - Journal of Environmental Management
   - Jordan Journal for Agricultural Sciences
   - Jordan Journal of Earth and Environmental Sciences
   - Mutah Lil -Buhuth Wad-Dirasat

Supervised M.Sc. & Ph.D. Thesis

1. ***Assessing The Hydrologic Vulnerability to Climate Change Impacts at Amman- Zarqa Basin, Jordan (Committee member).*** By M.Sc. Rihan Ahmad Al Saodi. January 2022. Master Degree of Environmental Technology and Climate Changes, Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
2. ***Measurements of the Aerosol Particles Concentrations Emitted from Indoor Kerosene Heaters (Committee member).*** By M.Sc. Nezar Maher Albqour. August 2021. Degree of (Master of Science) in Physics, Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
3. ***Soil Erosion Assessment and Control in Wadi Mujib Using GIS and Remote Sensing (Co-advisor).*** By M.Sc. Heba Saleh Tayseer AL-Malkawi. August 2021. Degree of (Master of Science) in Applied Geology, Faculty of Graduate Studies, the Hashemite University, Zarqa, Jordan.
4. ***Impact of TWW on Soil and Crops Irrigated Using Drip and Sprinkler Systems (Committee member).*** By Ph.D. Rola N. Rawashdeh. July 2021. Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
5. ***An Investigation for Aerosols Concentrations inside Selected Jordanian Indoor Environments (Committee member).*** By M.Sc. Ali Ameer Hisham Alwahsh. April 2021. Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
6. ***Assessment of Nitrate Leaching to Zarga River by Soil Water Assessment Tool (SWAT) Model (Committee member).*** By Ph.D. Rafa'a Khaled M. Abu Qaoud, December, 2020. Doctor of Philosophy Degree in Agriculture, Faculty of Graduate Studies, The University of Jordan, Amman, Jordan.
7. ***Spatial evaluation of soil texture using remote sensing techniques in Al Mafraq area- Jordan (Committee member).*** By M.Sc. Anas Ahmad Al-Yamani, August 2020. Master Program in Applied Geology, Deanship of Graduate Studies, Alalbayt University, Mafraq, Jordan.
8. ***Sequential fractionation of inorganic phosphorus of calcareous soils in Jordan. (Committee member).*** By M.Sc. Faris Fayyad Kamel AlShayeb, July 2020. Master in Climate Change and Dry Land Sustainability, Faculty of Graduate Studies, Hashemite University, Zarqa, Jordan.
9. ***An Environmental Study for the Effect of Sodium Adsorption Ratio with Flocculation-Dispersion on the Infiltration Capacity in North West Irbid of Jordan (Committee member).*** By M.Sc. Faten Khalife Abdel

Qader, December 2019. Master Program of Water Resources and Environment, Deanship of Graduate Studies, Alalbayt University, Mafraq, Jordan.

10. ***GIS and DRASTIC Model for Mapping and Assessment Groundwater Vulnerability to Contamination in Wadi Shuaib Basin, Jordan (Committee member).*** By Ph.D. Hassan Thabet Mohammed Khrisat, December 2019. Faculty of Graduate Studies, University of Jordan, Amman, Jordan
11. ***Simulation of Radioactive Pollution Emission Transport and Human Impacts during Hypothetical Accident Scenarios in a Nuclear Power Plant according to Jordanian Environmental Conditions (Committee member).*** By Ph.D. Marwan Mohammad Al-Kloub, December 2019. Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
12. ***Climate Change Vulnerability Index for Agriculture Sector in Yarmouk River Basin Area (committee member).*** By M.Sc. Ayat Said AL Qudah. November, 2019. Department of Natural Resources and Environment, Faculty of Agriculture, Jordan University of Science and Technology, Irbid, Jordan.
13. ***Improvement of Engineering Properties of Lightweight Concrete Using Geopolymers (Committee member).*** By By M.Sc. Farah Mahmoud Mousa Washah, November 2019. Department of Water Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
14. ***Effect of Using Raw Olive Wastewater (OMW) and Olive Solid Waste (OSW) on Selected Soil Properties (Co-advisor).*** By M.Sc. Entethar Ali Salem Al-Shakhatrah, November 2019. Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
15. ***Influence of Different Irrigation Water Types and Levels on Panicum Maximum (guinea grass) Germination and Yield as a Climate Change Mitigation Measure (committee member).*** By M.Sc. Khadija Sameh Shaker Khamish, November 2019. Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
16. ***Deforestation Effects on Physical and Chemical Properties in Ajloun, Northwestern Jordan (committee member).*** By M.Sc. Lima Mryan. August, 2019. Department of Natural Resources and Environment, Faculty of Agriculture, Jordan University of Science and Technology, Irbid, Jordan.
17. ***Study of the efficiency of the use of irrigation water in the district of Sarhan Governorate Mafraq (Co-advisor).*** By M.Sc. Nasser Mostafa Mohammed Hassan, July 2019. Master Program of Water Resources and Environment, Deanship of Graduate Studies, Alalbayt University, Mafraq, Jordan.
18. ***Investigating the potential use of the Dimensionless Temperature as a new drought index (Committee member).*** By Ph.D. Sfa'a Ayyash, July 2019. Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
19. ***Particulate matter concentrations in Amman and Zarqa based on mobile setup (Committee member).*** By Ph.D. Shatha Suleiman Ahmad Ali Saleh, July 2019. Department of Physics, Faculty of Sciences, University of Jordan, Amman, Jordan.
20. ***Investigating Amman's residential landscape plant diversity: implications for conservation of valuable plant species (Committee member).*** M.Sc. Amani Muhammed Al-Kafawin, July 2019. Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
21. ***Development of a Geospatial- Based Combined Index for Drought Over Jordan (Committee member).*** By Ph.D. Maram Jameel Al Naimat, April 2019. Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
22. ***Investigating Spatial and Temporal Variability of Selected Climatic Variables in Jordan Using Advanced Mathematical Modeling Techniques (Advisor).*** By M.Sc. Lana Bassam Al-Fraihat, February 2019. Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan. 2.
23. ***Reclamation of Saline-Sodic Soils by Gypsum and Compost (Committee member).*** By M.Sc. Areen Salah Sharaf, February 2019. Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
24. ***Fine Aerosol Concentrations Daily Pattern Differences Between Spring and Autumn in the Urban Background Atmosphere of Amman (Committee member).*** By M.Sc. Zain M.H. Shelbayeh, December, 2018. Department of Physics, Faculty of Sciences, University of Jordan, Amman, Jordan.

25. ***Effectiveness of Continuous Contour Ridges and Intermittent Trenches Constructed Using the Vallerani in Water Harvesting in Arid Lands (Committee member).*** By Ph.D. Kifah, December, 2018. Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
26. ***Changes in Land Productivity as A Parameter for Achieving Land Degradation Neutrality in Jordan (committee member).*** By M.Sc. Shadi Awni Abdelrahman Al-Shawabkah, July, 2018. Department of Natural Resources and Environment, Faculty of Agriculture, Jordan University of Science and Technology, Irbid, Jordan.
27. ***Assessment of Remote Sensing Indices for Drought Monitoring in North of Jordan*** (***committee member).*** By Ph.D. Ibrahim A. Farhan, May 2018. Department of Land, Water and Environment, Faculty of Agriculture, University of Jordan, Amman, Jordan.
28. ***Potential Impacts of Climate Change on Surface Water Resources of Amman-Zarqa Basin using Downscaled Regional Circulation Model and Soil Water Assessment Tool (Co-advisor).*** By M.Sc. Ibrahim Khalil Al-Hassani, April 2018. Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
29. ***Phytoremediation of Contaminated Soil with Polycyclic Aromatic Hydrocarbons Using Helianthus annuus (Committee member).*** By M.Sc. Ismail Ahmad Alhuniti, January 2018. Master Program of Climate Change and Dry Lands Sustainability, Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
30. ***Simulation and adaptation measures of the impact of climate change on barley productivity in Jordan (committee member).*** By Ph.D. Hiba Mashhour AL-Kharabsheh, August 2017. Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
31. ***Investigation for Spatial Distribution of Some Soil Chemical Elements at al Hashimeyeh Municipality (Co-advisor).*** By M.Sc. Imran Mahmoud Al - Harrahsheh, July 2017. Master Program of Climate Change and Dry Lands Sustainability, Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
32. ***Climate Change Vulnerability Analysis of "Al Salt Village" based on Community Assessment (Co-Advisor)***. By M.Sc. Hala Mohammed Jamil Abdallat, April 2017. Master Program of Climate Change and Dry Lands Sustainability, Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
33. ***Vegetation Responses in Open Access Areas and Exclosure Areas at Yarmouk Protected Area in Northern Jordan*** (committee member). By M.Sc. Aladdin Omar Abdallah Al-Hiyasat, April 2017. Master Program of Climate Change and Dry Lands Sustainability, Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
34. ***Investigation the Surface Water Contamination and Fate in the Eastern Region of Lower Jordan River (Advisor).*** By M.Sc. Zainab S. Abu Zaid, 2016. Master Program of Climate Change and Dry Lands Sustainability, Department of Land Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
35. ***Future prediction of Climate Variables Using Advanced Statistical Methods (Advisor).*** By M.Sc. Mostafa Shokri Al-Sawalhah, 2016. Department of Earth & Environment Sciences, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
36. ***Investigating the Spatio-Temporal Changes of NDVI with relationship of some climatic variables using Remote Sensing and Geographical Information System techniques at Yarmouk Basin (Co-Advisor).*** By M.Sc. Heba Mohammed Amin Abu Alassal, 2016. Department of Earth & Environment Sciences, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
37. ***Evaluation and Conform the Treated Greywater from Different Systems to Jordan Reclaimed Greywater Standards JS1776:2013*** (committee member), by M.Sc. Ola T. Al-Qawasmi. December 2015. Environmental Science and Management Master Program, Department of Water Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
38. ***Developing a Forecast Model to Estimate Instantaneous Troposphere Ozone Based on Air Temperature*** (committee member), by M.Sc. Khitam Mansour Edibat. December 2015. Environmental Science and Management Master Program, Department of Water Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.

39. ***Impacts of Climate Change on Water Resources in Mujib Basin Using Statistical Downscaling Techniques Based on Various General Circulation Models (GCMS) Experiments*** (committee member), by M.Sc. Moh'd Kotaiba Mohammad Abugazleh. August 2015. Faculty of Graduate Studies, University of Jordan, Amman, Jordan.
40. ***An Integrative Approach for Modeling Surficial Uranium Deposits at Central of Jordan, Siwaqa Area*** (committee member), by M.Sc. Samer Hmoud. May2015. Department of Earth & Environment Sciences, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
41. ***Impacts of Treated Wastewater on Some Soil Properties and Production of Gladiolus communis*** (committee member), by M.Sc. Heba Ibrahim Hasan. December 2012. Department of Land, Water and Environment, Faculty of Agriculture, University of Jordan, Amman, Jordan.
42. ***Assessment of Climate Change Impacts on Water Resources in Mujib Basin (Central Jordan)*** (committee member), by M.Sc. Mohammed Jaber. July 2012. Department of Water Management & Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
43. ***Developing a National Environmental Management Plan for Controlling Leishmaniasis in Syria using GIS and Remote Sensing*** (committee member), by M.Sc. Nafan. May 2012. Department of Water Management & Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
44. ***Measurement of Natural Radioctivity concentration levels in soil samples in Al Hashemyah-Asokhna Region*** (committee member), by M.Sc. Laith H. Al-Qudah. May 2012. Department of Earth & Environment Sciences, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
45. ***Evaluating Land Cover Changes In Zarqa River Basin Using GIS And Remote Sensing Techniques*** (Advisor), by M.Sc. Ansam Khaled Al-Khawaldeh. July 2011. Department of Earth & Environment Sciences, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
46. ***Spatial Variability Investigations of Selected Soil Physical Properties at the Central Jordan Valley*** (Co-Advisor), by M.Sc. Yousef Osama Al-Saleh. March 2011. Department of Land, Water and Environment, Faculty of Agriculture University of Jordan, Amman, Jordan.
47. ***Delineation of Groundwater Protection Zones and Vulnerability Mapping in WadiEs-Sir Area using GIS and Isotope Techniques*** (committee member), by M.Sc. Farah Abbas Mushrif Al Efan. May 2010. Department of Geology, Faculty of Sciences, University of Jordan, Amman, Jordan.
48. ***Drought Assessment at Wadi Mujib Basin Using Advanced GIS & Remote Sensing Techniques*** (Co-Advisor), by M.Sc. Amena Hesham Abazeed. May 2010, Department of Earth & Environment Sciences, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
49. ***Optimization Water Use Efficiency of Green House Cucumber Growing Under Deficit Irrigation in Jordan Valley*** (Co-Advisor), by M.Sc. Tareq M. Najdat Kandaji. April 2010. Department of Land, Water and Environment, Faculty of Agriculture, University of Jordan, Amman, Jordan.
50. ***Assessing and Modelling Tomato Yield and Water Saving Under Water Deficit in Jordan Valley*** (committee member), by M.Sc. Rami Al-Qerem. December 2009. Department of Land, Water and Environment, Faculty of Agriculture, University of Jordan, Amman, Jordan.
51. ***Geo-Environmental Quality Assessment of Wadi El-Mujib Groundwater Resources Using Advanced Statistical and Geographical Information System*** (Co-Advisor), by Ph.D. Abeer Sh. Salman. May 2009. Department of Geology, Faculty of Sciences, University of Jordan, Amman, Jordan.
52. ***An Integrated Approach to Groundwater Exploration in Khan EzZabib Area Using Remote Sensing and Geographic Information System*** (committee member), by M.Sc. Mohammed Issam Barakat, May 2008. Department of Earth & Environment Sciences, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan.
53. ***Estimating Grass Reference Evapotranspiration Using a Soil Water Dynamic Model and Soil Moisture Measurements*** (committee member), by M.Sc. Ala'a Hamad Homaidan. May 2008. Department of Land, Water and Environment, Faculty of Agriculture, University of Jordan, Amman, Jordan.
54. ***Effect of Sludge Type and Application Rate on the Physical Properties of Dry Soils***, (committee member), by M.Sc. Nesreen Ameen Abu-Aisheh, May 2008. Department of Land, Water and Environment, Faculty of Agriculture, University of Jordan, Amman, Jordan.

55. ***Removal of Heavy Metals from Industrial Wastewater*** (committee member), by Using Zeolite, by M.Sc. Nivin Al-Dahodia, April, 2007. Department of Land, Water and Environment, Faculty of Agriculture, University of Jordan, Amman, Jordan.
56. ***Studying of Soil Spatial Variability from Soil Data and Remotely Sensed Data*** (Co-Advisor), by M.Sc. Zeinah Waleed Al-Haj Baddar, January 2007. Department of Land, Water and Environment, Faculty of Agriculture, University of Jordan, Amman, Jordan.
57. ***Reserve Calculations of Clays and Diatomite in Azraq Area*** (committee member), by M.Sc. Abeer Sh. Salman. May, 2005, Department of Earth & Environment Sciences, Faculty of Natural Resources and Environment, Hashemite University, Jordan.

Awards & Acknowledgements

1. ***Certification of Participation in the "Applications of Lab Biosafety and Biosecurity Workshop"*** (5th December 2018). The Hashemite University, Zarqa, Jordan.
2. ***Certification of Participation in the Eighth Scientific Agricultural Conference*** (15-17 October 2018). Mu'ta University, Karak, Jordan.
3. ***Certification of acknowledgement for Cooperation on Succeeding the Fifth Scientific Agricultural Conference*** (9-12 May 2005). Balqa University, Salt, Jordan.
4. ***Certification of Appreciation for Cooperation on Succeeding the Event Climate March from Balqa to Aqaba holding a great message "Stop Changing the Climate"*** (2nd November, 2017). Green Generation Foundation (GGF), Amman, Jordan.
5. ***Irrigation Systems Design and Installation Expert***. (10th October, 2017). Agriculture Engineers Association, Amman, Jordan.
6. ***Expert Science Fair Evaluator***. Mayar International Schools. Science Fair 2014.
7. ***Role Model***. The First National Conference on Science Education Project based on the survey "Interactive Series", coordinated by Jordanian Society for Scientific Research, funded by the European Commission, FP7 2014.
8. ***Brilliant Professor***. Faculty of Natural Resource & Environment, Graduate Students Award, Hashemite University, Zarqa, Jordan, 2013.
9. ***Acknowledged Vice Dean***, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan, 2011.
10. ***Acknowledged Dean Assistant***, Faculty of Natural Resource & Environment, Hashemite University, Zarqa, Jordan, 2010.

SKILLS

a. Long and advanced experience in **project management**, including designing, implementing, monitoring, reporting, assessing, and evaluating national and international projects using advanced methodologies to provide technical guidelines, scientific findings, gap analyses, and lessons learned.
b. Extensive experience in **community engagement and capacity building**, serving as a lecturer, trainer, and facilitator with strong communication skills across multidisciplinary environmental and agricultural sectors.
c. Long experience in **organizing workshops, technical meetings, and international conferences**, ensuring high scientific quality, interaction, and audience engagement.
d. Advanced experience in **developing Geospatial Data Models** (conceptual, logical, and physical), **Data Dictionaries**, and **Data Registers** using enterprise architecture frameworks for environment–water–agriculture sectors.
e. Experienced in designing and implementing **Problem-Based Learning (PBL)** and other active learning techniques in academic and professional settings.

f. Long and advanced experience in **mathematical, statistical modelling, and data mining**, using analytical software such as **JMP, SAS, SPSS**, Python, and R for environmental, agricultural, climate, and hydrological datasets.
g. Strong expertise in **climate change modelling and impact assessment**, using tools such as **LEAP, SWAT, DSSAT**, and other sectoral modelling systems for vulnerability and adaptation analysis.
h. Extensive experience in **spatial environmental modelling**, including soil and land degradation assessments using **GS+, ArcMap, ArcGIS Pro, QGIS, and GSLib**.
i. Long experience in **solute transport and groundwater modelling**, using **Chemflux, ChemFlow, MODFLOW, HYDRUS (1D/2D)**, and related analytical packages.
j. Long experience in **irrigation system design, evaluation, and management**, using software such as **CropWat, AquaCrop, WaterMark, IrriPro, and IrriCAD**, with strong emphasis on smart irrigation, fertigation, and water-use efficiency.
k. Long and advanced experience in **field and laboratory experimental design**, environmental sampling, data analysis, and interpretation for soil, water, crop, and climate assessments.
l. Solid experience in **online, e-learning, and digital training tools** (Moodle, Microsoft Teams, Zoom, Webex, Google Suite, Kahoot, Slideshare, etc.) for professional and academic capacity development.
m. Strong expertise in **environmental QA/QC and data validation** for water, soil, dust, wastewater, and groundwater datasets, applying international frameworks such as **USEPA SW-846**, **USEPA National Functional Guidelines**, **USEPA CLP**, **NYSDEC DER-10**, and **ISO/IEC 17025**, as well as **ISO 5667** (water sampling), **ISO 18400** (soil sampling), and **ISO 18512** (dust/inorganic sampling). This experience ensures that environmental datasets are reliable, traceable, and fit for modelling, reporting, and decision-making.

LANGUAGES

Arabic : Mother Language
English : Excellent, read, write and speak.
Russian : Good, read, write and speak.

PROFESSIONAL SOCIETY MEMBERSHIP

- *Soil Science Society of America.*
- *Sigma Xi (The Scientific Research Society).*
- *Gamma Sigma Delta (The Honour Society of Agriculture).*
- *Soil and Water Conservation Society.*
- *Jordanian Association of Agricultural Engineers.*
- *Jordanian Society for Scientific Research.*
- *Jordanian Environmental Society.*
- *The Jordanian Society for Desertification Control & Badia Development.*
- *Association of Agricultural Research Institutions in the Near East & North Africa / Water Use Efficiency Network*
- *Member of community 'Water Accounting & Water for Food" and "FAO" (Dgroups)*

CONTACT INFORMATION

The Hashemite University
Prince Hassan Bin Talal for Natural Resources and Environment
Department of Land Management and Environment
Zarqa, Jordan
Phone (Mobile): +962796700222
Email: qinna@hu.edu.jo
Scopus Author ID: 36609779400
https://orcid.org/0000-0002-1012-6817

References

1. **Mr. Mohammed Ferdous**, Partner and Director of the Agriculture Sector, The Palladium Group, +966555202683, Mohammad.Ferdous@thepalladiumgroup.com
2. **H.E. Prof. Saeb Khresat**, Minster of the Ministry of Agriculture, Amman, Jordan, Mobile +962796600222, email: skhresat@just.edu.jo
3. **H.E. Dr. Ayman Sulaiman,** Minister of the Ministry of Environment, Amman, Jordan, Mobile +962797377792.
4. **Prof. Fayez Ahmad**, Dean of the Prince El-Hassan bin Talal Faculty for Natural Resources & Environment / Hashemite University, Zarqa, Jordan, Mobile +962795964502, email: fayeza@hu.edu.jo
5. **Mr. Bater Wardam**, GIZ Jordan Environment & Climate Programme Project Manager (AV), c/o Ministry of Environment, Amman- Jordan, Mobile +962799866644, email: batir.wardam@giz.de

ATTACHMENT C

SAMPLE CHAIN OF CUSTODY FORM

ALS Environmental

Air - Chain of Custody Record & Analytical Service Request

Page _____ of _____

Laboratory location:

_____

_____

Requested Turnaround Time in Business Days (Surcharges) please circle 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard	ALS Project No.

Company Name & Address (Reporting Information)	Project Name	ALS Contact:	**Analysis Method**		**Comments** e.g. Actual Preservative or specific instructions
	Project Number				
Project Manager	P.O. # / Billing Information				
Phone / Fax					
Email Address for Result Reporting	Sampler (Print & Sign)				

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume			

Report Tier Levels - please select

Tier I - Results (Default if not specified) _____ Tier III (Results + QC & Calibration Summaries) _____

Tier II (Results + QC Summaries) _____ Tier IV (Data Validation Package) 10% Surcharge _____

EDD required Yes / No

Type: _____ Units:_____

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	Cooler / Blank Temperature ____°C

Signature denotes acceptance of ALS Group USA, Corp. Terms and Conditions - Please click the link below for detailed Terms & Conditions:

ATTACHMENT D

CONVENTIONAL LABORATORY QA/QC

balQUALITY ASSURANCE MANUAL for ALS ENVIRONMENTAL – STRATFORD

120 Research Drive
Stratford, Connecticut, 06615
+1 203 325 1371

www.alsglobal.com

Reference Method:	TNI EL-V1M1, M2, and M4: 2016	Implementation Date:	01 December 2025
Document Control #:	QualityManual	Approved Date:	17 November 2025
Revision (Legacy) Number:	3.4	Approved By:	Corey Olsewski **Laboratory Director**
eQMS Issue Number:	25		Cassie Mosher **Operations Manager**
			Zachary Scott **Quality Assurance Manager**

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CONTROLLED DOCUMENT

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Change History:100

Revision	Date Revision Completed	Change Description	Training Required
25	15 Nov 2025	Complete rewrite to align with ALS format, policies, and procedures. Updated cover-page to incorporate eQMS features.	Yes
3.3	4 Dec 2023	Added change history and table of contents. Updated preface to redefine organization. Added and updated regulatory references. Revised Sections 5.3.u, 5.3v and Ethics Policy in 5.3.t.	Yes

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Quality Assurance Manual (QAM) Cross Reference Table

ALS Laboratories have developed their quality management systems to align with several regulatory requirements. This document has been written to align with the ISO/IEC 17025:2017 organization of topics. The following cross-reference table indicates how this (QAM) aligns to TNI EL-V1M2:2016 and ISO/IEC 17025:2017 with regards to section content and organization. Of note, the Preventive Action section 4.12 from ISO/IEC 17025:2005 has been revised into a new risk management and improvement section in ISO/IEC 17025:2017 (sections 8.5 and 8.6 respectively).

ALS QAM	Section Content	ISO/IEC 17025:2005 TNI EL-V1M2 2016	ISO/IEC 17025:2017
1	Scope	1.1, 1.2	1
2	Normative References	2.0	2
3	Terms and Definitions	3.0	3
4	General Requirements	4.1	4
4.1	Impartiality	4.1.4, 4.1.5b, 4.1.5d	4.1
4.2	Confidentiality	4.1.5c	4.2
5	Structural Requirements	4.1.5, 4.2.6, 4.2.1, 4.2.3, 4.1.6, 4.2.2, 4.2.7	5
6 and 7	Resource Requirements	4.0	6
6.1 and 7.1	General	4.1.5a, 5.3.1, 5.5.1	6.1
6.2 and 7.2	Personnel	4.1.5, 5.2	6.2
8	Facilities and Environmental Conditions	5.3	6.3
9	Equipment	5.5, 5.6.1	6.4
10	Metrological Traceability	5.6, 5.9.1.1	6.5
11	Externally Provided Products and Services	4.5, 4.6, 5.10.6	6.6
12	Review of Requests, Tenders, and Contracts	4.4, 4.5.2, 5.4.2	7.1
13	Selection, Verification, and Validation of Methods	5.4	7.2
14	Sampling	5.7	7.3
15	Handling of Test or Calibration Items	5.8	7.4
16	Technical Records	4.13.2	7.5
17	Evaluation of Measurement Uncertainty	5.4.6	7.6
18	Ensuring the Validity of Results	5.9, 5.5.6, 5.5.10	7.7
19	Reporting of Results	5.10	7.8
20	Complaints	4.8	7.9
21	Nonconforming Work	4.9	7.10
22	Control of Data and Information Management	5.4.7	7.11
23	Management System Requirements	4.0	8
23	Options	NS	8.1
24	Management System Documentation (Option A)	4.2	8.2
25	Control of Management System Documents (Option A)	4.3	8.3
26	Control of Records (Option A)	4.13	8.4
27	Actions to Address Risks and Opportunities (Option A)	some of 4.12	8.5
28	Improvement (Option A)	4.10, 4.7.2	8.6
29	Corrective Actions (Option A)	4.11	8.7
30	Internal Audits (Option A)	4.14	8.8
31	Management Review (Option A)	4.15	8.9

1. Scope, Application, Overview, Commitments, and Implementation

ALS Environmental – Stratford (ALS) was formerly known as York Analytical Laboratories Inc. (YAL). It was purchased by ALS Group USA, Corp. on 1 April 2024. The legal entity of YAL is in the process of being retired (completion goal early 2026). Until this happens, the name of the laboratory as registered with the Accreditation Bodies and found on the Scope of Accreditations and Client Reports will remain as YAL. Internal documentation will be transferred to ALS branding requirements as the documents become due for review or are revised.

Footnotes are used through this quality manual and contain information to further explain a requirement. When instructions are contained within a footnote, it is required procedure.

The abbreviation "ALS" refers to the regional and/or global company and "ALS-Stratford" refers to the single laboratory.

1.1. Scope and Application

This Quality Assurance Manual (QAM) describes the policies, procedures and accountabilities established by the Laboratory of ALS Environmental - Stratford (ALS-Stratford) to ensure that the test results reported from analysis of water, soil, waste, and other matrices are reliable and of known and documented quality. This document describes the quality assurance and quality control procedures followed to generate reliable analytical data.

This QAM is designed to be an overview of ALS-Stratford operations. Detailed methodologies and practices are written in Standard Operating Procedures (SOPs). Where appropriate, corporate ALS SOPs are referenced in this document to direct the reader to more complete information. A complete listing of SOPs is available by Excel export of the Document Register within the Document Control module of eQMS. This is the centralized SharePoint library Document Control system utilized by all USA ALS Environmental laboratories. SOP references within this document will include the eQMS legacy ID to facilitate simplified navigation.

ALS-Stratford maintains certifications pertaining to various commercial and government entities[1]. Each certification requires that the laboratory continue to perform at levels specified by the programs issuing certification. Program requirements can be rigorous. They include proficiency evaluations as well as regular audits of the laboratory to verify compliance.

1.2. Overview of the Organization

ALS Environmental – Stratford (ALS-Stratford) is part of ALS Group USA which is in turn part of ALS Limited global operations, an ASX100[2] company. There are several policies and procedures maintained by the Chief Executive Officers, ALS committees, and other Regional Managers that lay the foundation for all ALS Laboratories. Since ALS Limited is a Public Company registered on the Australia Stock Exchange, there is a Board of Shareholders that review and approve these policies and procedures together with ALS Executive Managers. Current and controlled versions of these documents are maintained on a secure intranet SharePoint site (Policies - Grouped By Language (alsglobal.com)), and APPENDIX E – STANDARD OPERATING PROCEDURES lists a summary of the specific documents, their content and to which section of the QAM they are applied.

The current goals, values, and objectives of the company are:

VISION		To be the global leader in the discipline of scientific analysis in pursuit of a better world for all.
MISSION		ALS is using the power of testing to solve complex challenges. With a passion for science, we serve clients with data-driven insights for a safer and healthier world.
PURPOSE	Science	We aim to relentlessly expand the way our science is deployed across all areas of human endeavor.
	Assurance	Our effort for the clients we serve must be quality without exception as the most trusted in the world.
	Sustainability	Promote principles that we know to be beneficial and engage in authentic ways with the world around us.
VALUES	Safety	More than a policy, safety is our DNA. Managing risk and protecting the well-being of our people guides every aspect of the way we do business.
	Resilient	Nothing worthwhile is ever easy. It is precisely our ability to overcome obstacles and self-belief that brings value to the task-at-hand.

[1] A client accessible portal is available through ALS Solutions. Contact the Laboratory to be setup with access.

[2] ASX is the Australia Stock Exchange and 100 means that ALS is one of the 100 top companies in Australia as per that Stock Exchange rating. ALS is a publicly traded company that is held accountable to a Shareholder Board.

Curious	Innovation is drawn from the eagerness of doing things better. To be open-minded means we will give new ideas their proper measure before rendering judgement.
Committed	We are part of a team that relies on one another to deliver our best. Each time we perform a task remember that a client or colleague is counting on our continued effort towards improvement as well as our unrivalled hard work.
Caring	Our enduring focus is on diverse people and their ideas. We encourage a culture of freethinking and problem-solving. We are part of the greater good, so let's celebrate the wins together and make the world just a little better.
Honest	Truth is the precursor to knowledge. There can be no science built on falsity. Be honest in what you know and don't know. Speak simply and with integrity so that others can appreciate both.

1.3. Quality Assurance Policy

ALS-Stratford is committed to producing legally defensible analytical data of known and documented quality acceptable for its intended use and in compliance with applicable regulatory programs. This QAM is designed to satisfy the applicable requirements of the various States, United States Environmental Protection Agency (EPA), TNI EL-V1:2016 Modules 1, 2, and 4, and ISO/IEC 17025:2017, and other normative references listed in Section 2.

ALS Corporate Management has committed its full support to provide the personnel, facilities, equipment, and procedures required by this QAM and other client and project related requirements (refer to ALS Corporate Quality Management policy on ALSNET).

ALS management reviews its operations on an ongoing basis and seeks input from staff and clients to make improvements. ALS is committed to good professional practice and a high standard of service.

It is the policy of ALS that all employees be familiar with all quality documentation.

1.4. Quality System

This QAM and SOPs referenced in this document (available on ALSNET eQMS Document Register) combined with the Corporate Polices on ALSNET comprise the ALS-Stratford management system. This management system includes all quality assurance policies and quality control procedures. SOP references within this document will include the eQMS legacy ID to facilitate simplified navigation.

Although verbal communication with employees is essential, written and visual communication through email and computer systems is the cornerstone of effective communication at ALS. Computer workstations throughout the lab provide access to LIMS, procedures and email systems. All information essential for effective and consistent communication of analytical requirements and details affecting quality is available through these computerized systems.

1.5. Ethics and Data Integrity

It is the policy of ALS to perform work for clients in the most efficient manner possible, avoiding waste of resources. It is the role of both ALS management and employees to ensure that work for clients is performed most efficiently and effectively by properly utilizing ALS purchased materials, equipment, and the time and ability of personnel.

It is the policy of ALS to generate accurate and reliable data in accordance with contractual and regulatory requirements.

The ALS SOP Education and Training in Data Integrity – Ethics and Legal Responsibilities (found on eQMS; ADMINEthics) includes procedures, policy, and definitions on these topics:

- Any undue pressure applied to employees in the performance of their duties must be reported.
- It is against ALS policy to improperly manipulate or falsify data or to engage in any other unethical conduct.
- Prevention and detection of improper, unethical or illegal actions.
- Reporting and investigation of data manipulation, falsification of data, waste of resources, or other unethical practice or misconduct.

The Corporate ALS SOP *Code of Conduct* (found on ALSNET under Global Corporate Polices) covers such topics as:

- responsibilities and authorities for all ALS Employees
- consequences of Code Conduct violations
- explanation of ALS Core Values and Commitments

- expectations for conducting business at all role levels including data integrity, confidentiality, use of information, insider information, privacy and protection of personal information, and protection and use of company assets and resources
- interacting with 3rd parties including competing fairly and lawfully, working with suppliers and business partners, conflicts of interest, bribery and corruption, gifts and hospitality, trade sanctions and export controls and public comment and social media
- reporting violations to the Code of Conduct emphasizes the need to speak up when something occurs either directly to other ALS roles or through the ALS Business Integrity Helpline hotline.

Laboratory Required Data Integrity and Ethics and Code of Conduct training for all staff:

Initial and annual refresher training on Ethics and Data Integrity and Code of Conduct is performed for all employees through a nationally maintained ALSTAR[3] training portal. Key topics covered are the critical need for honesty and full disclosure in all analytical reporting, how and when to report data integrity issues, and record keeping. Training includes discussion regarding all data integrity procedures (corporate and site), data integrity training documentation, in-depth data monitoring, and examples of improper actions. It covers the topics indicated in the SOPs in the previous section.

1.6. Permitting Departures from Policies and Procedures

Permitting departures from documented policies and procedures or from standard specifications may be allowed and is dependent on project contractual requirements and technical feasibility. Approval by ALS Management and the client is required. In addition, ALS requires that deviations from contractual requirements that might affect data quality be reported to clients with the sample results.

The pertinent ALS Project Manager (PM) must approve deviations from contractual requirements. The PM obtains approval for any such deviations, either in writing by email or by phone (documented in a phone log) from pertinent contract authorities. In addition, ALS requires that deviations from contractual requirements that might affect data quality be reported to clients. Any employee who knowingly manipulates and/or falsifies data or documents or engages in any unethical conduct is subject to immediate release from employment.

1.7. Consequences for Unauthorized Violations

Any employee who knowingly manipulates and/or falsifies data or records or engages in any unethical conduct is subject to immediate release from employment. ALS employees who are aware of, or reasonably suspicious of, any case of data manipulation, falsification of data, waste of resources, or other unethical practice or misconduct shall notify any manager. Under the direction of the laboratory director, every allegation of unethical conduct will be fully investigated.

1.8. ALS Whistleblower Procedure

The ALS Whistleblower document is found on ALSNET under Global Corporate Polices and the ALS Business Integrity Helpline hotline information is posted in a visible site at the Laboratory. This procedure explains the roles and responsibilities of all Employees with regards to reporting or receiving a report of questionable action and the subsequent investigation, including the protections offered for those involved.

Employees have the option of reporting questionable actions either internally or externally as follows:

Internal reporting:

- Chief Executive Officer
- General Counsel and Company Secretary
- Business Stream Executive General Manager
- Chief Financial Officer
- Chief People Officer
- Chief Strategy Officer
- Chief Digital
- Director Group Assurance
- Fraud & Forensic Manager
- a Business Stream General Manager
- a Senior Site Supervisor or Senior Site Manager

[3] USA Environmental *Ethics and Data Integrity* training is found under ALSTAR course ID 0000033239. This course if maintained by the National Quality Manager for USA Environmental. ALS Corporate *Code of Conduct* training is found under ALSTAR course ID 0000032657. This course is maintained by Corporate ALS Audit and Risk Committee.

- a member of the ALS Limited Board.

External reporting is through a helpline operated by an independent 3rd party service provider: Deloitte. Access to the hotline is through several means:

ONLINE	via smartphones, desktops, laptops and tablets by visiting www.alshelplines.deloitte.com.au to complete a report form online in your preferred language.
BY PHONE	by calling the dedicated toll-free number +61 3 9667 3788. You will be connected to a Helpline forensic analyst who will ask you a series of questions to record the details of the Notifiable Conduct. Alternatively, you will be given the opportunity to make a report via a recorded message in the local language of your office.
BY EMAIL	by emailing alshelplines@deloitte.com.au
BY POST	by sending a letter to: **ALS Business Integrity Helpline** Reply paid 12628 A'Beckett Street Melbourne VIC 8006

1.9. ALS Commitment to Health, Safety, and the Environment

ALS is committed to ensuring a safe and healthy workplace is provided for all employees, contractors, and visitors. "WE ARE SAFE" is one of the core values and the Corporate HSE policy is available on ALSNET under Global Corporate Polices. HSE related policies and procedures are maintained by the Global HSE group and have separate manuals, policies, and procedures that are distributed to all Employees. As this document focuses on the quality management systems, please contact your local site HSE representative for more information and training requirements.

2. Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 17025:2017, *General requirements for the competence of testing and calibration laboratories*

TNI 2016, VOLUME 1, *Management and Technical Requirements for Laboratories Performing Environmental Analysis*

specifically Modules 1, *Proficiency Testing*, 2, *Quality Systems General Requirements*, and 4, *Quality Systems for Chemical Testing*

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms* (VIM1)

ISO/IEC 17000, *Conformity assessment — Vocabulary and general principles*

3. Terms and Definitions

Common abbreviations, terms, definitions and unit descriptions can be found in APPENDIX A – ABBREVIATIONS, TERMS, DEFINITIONS AND UNITS.

4. General Requirements

4.1. Impartiality and Conflicts of Interest

The following agreements and procedures ensure ALS-Stratford staff are free from undue internal and external commercial, financial, and other pressures or influences that could adversely affect the quality of work. They protect customers' confidential information and ALS' proprietary rights. They ensure avoidance of activities that could diminish confidence in the competence, impartiality, judgment or integrity of any ALS laboratory and staff. Refer to Section **1.5** for additional information, especially training requirements. Additional Corporate policies and procedures that relate to the Code of Conduct are summarized in APPENDIX E – STANDARD OPERATING PROCEDURES.

Code of Conduct Agreement

Provides a framework for decisions and actions in relation to conduct in employment. The agreement covers a wide range of topics including personal and professional behavior, conflicts of interest, gifts and favors, confidentiality, legal compliance, security of information, among others. This agreement is administered and maintained by the USA HR Department and is provided to the employee during the hiring and induction process.

Ethics and Data Integrity Agreement

Provided to the employee as part of the hiring and induction process and reviewed during periodic ethics refresher training. This is coordinated between the Human Resources and Quality Assurance (QA) departments. All employees are required to take annual ethics and data integrity refresher training. A template of the agreement is included in APPENDIX C – ETHICS AND DATA INTEGRITY ATTESTATION STATEMENT.

In addition to these agreements, PMs act as a firewall to insulate the analysts from clients so that the lab personnel have no direct contact with clients. Lab IDs are assigned to samples and used throughout preparation and analysis to make the samples ambiguous to lab personnel. Together these agreements and procedures ensure freedom from undue internal and external commercial, financial, and other pressures or influences that could adversely affect the quality of work.

It is the responsibility of all staff to comply with all procedures, be familiar with current management systems and policies, and to record all data as established by management. This and the peer review of all data will ensure that all testing is objective, and conflicts of interest do not exist. As a commercial laboratory, the decision-making using test results, opinions and interpretation of data is outside the scope of the laboratory activities.

4.2. Confidentiality

All employees sign a confidentiality statement upon employment. These are maintained by and available from Human Resources (HR).

Documents provided to the laboratory are held in strict confidence by project management staff. Documents pertaining to quality assurance and analytical requirements are reviewed with appropriate managers and staff through the project specific meetings and LIMS. Project related information provided by clients is securely archived using procedures described in the ALS-Stratford SOP *Control and Retention of Records* (see eQMS; ADMINRECORDS).

It is the responsibility of all ALS employees to safeguard sensitive company information, client data, records, and information; and matters of national security concern should they arise. All information, data, and reports collected or assembled on behalf of a client is treated as confidential. Information may not be given to third parties without the consent of the client.

The transmittal of final results is specified by clients and follows those requirements unless specific changes are made by the ALS PM(s) assigned to the client/project.

5. Structural Requirements

The laboratory is a legal entity that is part of ALS USA Corp (registration number 76-0606679). Since ALS is a global company, there are 3 levels of management: location, regional (USA), and global. The reporting structure is as follows:

Laboratory Director → Regional Manager Eastern USA → USA General Manager (indirect to the National Operations Manager)

USA General Manager → Executive General Manager, Environmental → CEO and Managing Director ALS

This reporting organization with other key roles included is demonstrated through the organization charts found in APPENDIX B – ORGANIZATION CHARTS.

There are other support functions such as quality, technical, HSE, HR, accounting, procurement, and information technology that are provided to the laboratory by corporate or regional entities but none of whom are responsible for managing laboratory activities directly. The laboratory director is responsible for all aspects of the lab and for ensuring that activities comply with both ALS, legal and applicable regulatory requirements. Any onsite personnel that have support functions for this laboratory that are involved with testing and/or client services are under the direction of the laboratory director.

Refer to Sections 6 and 7.2 for additional information regarding key roles, responsibilities, and authorities.

This laboratory performs a range of inorganic and organic analyses using approved methods promulgated in the Code of Federal Regulations (40 CFR Parts 136 and 141). This QAM is designed to be an overview of ALS operations. Detailed methodologies and practices are written in ALS Standard Operating Procedures (SOPs). Where appropriate, ALS SOPs are referenced in this document to direct the reader to more complete information and include the eQMS link with document legacy ID to facilitate simplified navigation.

ALS management is committed to improvements of the management systems through compliance with its own policies and procedures. When changes are planned and implemented, the integrity of the management system is maintained.

Changes must be recorded in SOPs signed by management that minimally includes the QA Manager and the Technical Director.

6. Organizational Chart and Key Personnel

Refer to APPENDIX B – ORGANIZATION CHARTS for overall structure and direct and indirect reporting relationships for the various key roles.

Of note, the Technical Director at ALS-Stratford may not serve as a Technical Director at another laboratory without authorization from the primary accrediting bodies.

Specific sections of this document may assign additional responsibilities to these roles and other staff roles as needed for those specific section activities.

ALS-Stratford Laboratory Director Responsibilities:

- ✓ implementation of the quality and safety management systems and applicable standards, including communicating to the staff the importance of meeting customer, statutory, regulatory and ALS regional and global requirements;
- ✓ ensure employees have sufficient experience and training to perform QAM-related duties and procedures;
- ✓ supply the necessary facilities and equipment required to meet the commitments of the laboratory and ensuring that supplied facilities and equipment comply with regulatory specifications and tolerances;
- ✓ ensure the testing capabilities of the laboratory can meet contractual obligations;
- ✓ ensure that all testing activities, including field sampling, sample handling and receiving are conducted and records retained as described in this QAM, its related Standard Operating Procedures (SOPs), and its referenced methods;
- ✓ ensure that routine QC samples are prepared, analyzed, and reviewed as required by this QAM;
- ✓ ensure that at regular intervals audits are conducted and documented to monitor compliance with this QAM;
- ✓ ensure that control of nonconforming work is initiated and completed to remedy discrepancies or problems identified in any laboratory process, including the appropriate escalation to corrective action when nonconformities have the possibility to recur and/or there is impact to data integrity;
- ✓ conduct an annual management review of all processes and procedures associated with the management system to ensure compliance and identify improvements; and use this information to develop ongoing laboratory strategic plans.

ALS-Stratford Laboratory Supervisor Responsibilities

The Laboratory Supervisor is responsible to ensure the directives of the Laboratory Director are carried out.

ALS-Stratford Quality Manager Responsibilities

- ✓ supply regular reports on the performance of the laboratory in meeting quality system objectives to location and regional management, especially with regards to any requested metrics and format;
- ✓ ensure implementation of this QAM and relevant corporate ALS policies and procedures and applicable external standards;
- ✓ retain records demonstrating compliance with qualification and training requirements for laboratory roles (both initial and ongoing) that are necessary for the QAM-related activities;
- ✓ understand, monitor, and evaluate the quality assurance (QA) and quality control (QC) activities described in this QAM and its references, and report deficiencies and/or resource requirements to the Laboratory Director;
- ✓ plan and implement an annual internal audit schedule of laboratory activities that meets the frequency requirements of external regulations, oversee its completion to ensure compliance with this QAM and its references[4], and retain records generated from internal auditing activities;
- ✓ oversee the control of nonconforming work process for any deficiencies identified from internal and/or external sources and ensure the correct escalation to corrective action;
- ✓ participate in root cause analysis and approve corrective action reports;
- ✓ evaluate data in an objective manner, free of outside or managerial influence, including monitoring trends in various quality systems activities;

[4] The Quality Manager is not the only role that may conduct internal audits. All staff trained to be internal auditors and that have the necessary technical experience as defined by the qualifications in the specific activity SOP can conduct internal audits.

- ✓ oversee the continuous improvement process for any improvements identified from internal and/or external sources;
- ✓ ensure staff have the necessary instructions captured in controlled documents to enable the successful and consistent performance of laboratory activities and that all controlled documents used by the laboratory are maintained on the ALSNET eQMS Document Register (internal and external);
- ✓ maintain records that are generated by the laboratory activities that are defined in this QAM as per the requirements of section **16**.
- ✓ conduct or delegate to a responsible role an annual review or update of this QAM and related internal controlled documents as hosted on ALSNET eQMS Document Register;
- ✓ create an annual participation schedule and arrange the purchase of external performance evaluation (PE) samples that comply with external proficiency testing (PT) requirements as needed for maintaining the desired scope of accreditation for the laboratory[5] and for ensuring measuring system performance is aligned with industry standards.

ALS-Stratford Technical Manager Responsibilities

- ✓ ensure implementation of regulatory requirements and any applicable requirements from this document as they relate to testing activities;
- ✓ read, understand and follow this QAM, including identified external references;
- ✓ ensure that each set of reported results meets the requirements specified in this QAM and meets the client's requirements as defined in the applicable project requirements or contracts.
- ✓ ensure that personnel conducting testing activities are trained, authorized and competent;
- ✓ ensure that facilities and equipment are maintained and operating within required specifications;
- ✓ ensure that supplies are available and utilized effectively.
- ✓ immediately report technical and quality problems to the Laboratory Director or Quality Manager.

ALS-Stratford Project Manager Responsibilities

- ✓ ensure implementation of the requirements of this document and any applicable references as they relate to client activities;
- ✓ complete and distribute project related information for each project before the laboratory starts work on the project to the appropriate laboratory roles;
- ✓ immediately communicate to the laboratory changes made to projects in progress and record these changes as per the appropriate procedures;
- ✓ respond to client requests for information as quickly as possible[6];
- ✓ ensure LIMS work orders are reviewed and meet client project requirements before release to the laboratory;
- ✓ perform a review of results to verify that data reports submitted to the client meet project requirements;
- ✓ issue test reports.

ALS-Stratford Support Role Responsibilities (Sample Management, IT, Procurement, HSE, HR)

- ✓ ensure implementation of the requirements of this document and any applicable references as they relate to the support activities;
- ✓ read, understand and follow this QAM, including identified external references;
- ✓ ensure that procedures are followed and meet the client's requirements as defined in the applicable project requirements as appropriate to the support activities;
- ✓ ensure that personnel are trained, authorized and utilized effectively;

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[5] External PT participation requirements are defined by the EPA for the potable water program, within TNI EL-V1M1:2016 for TNI accredited analytes captured by FoPT tables, and State regulatory requirements.

[6] Ideally the PM should respond to the client within 1-3 hours or less of a request being submitted. It is understood this is not always possible. If the PM will be unable to reply within this time period, an automated response is required for emails and phone messages indicating that there may be a delay. When an absence is known, the PM will arrange an alternate role to ensure client queries are received and addressed.

- ✓ ensure that facilities and equipment are maintained and utilized effectively;
- ✓ ensure that supplies are available and utilized effectively;
- ✓ immediately report technical and quality problems to the Laboratory Director or Quality Assurance Manager;

6.1. Deputies

In the case of absence of the Laboratory Director, Technical Director or QA Manager, deputies are assigned to act in that role. Deputies are identified on the current laboratory organization chart (see APPENDIX B – ORGANIZATION CHARTS). It is expected that anytime any of these roles is absent for more than 1 hour, the indicated deputies will cover the role responsibilities.

Deputies must meet the qualification requirements of the role(s) they are covering (see Section 7.2).

As per TNI EL-V1M2:2016, deputies must be assigned when Technical Directors are absent for more than 15 consecutive calendar days. If a Technical Director is absent for more than 35 consecutive calendar days, the accreditation authorities must be notified. It is the responsibility of the QA Manager to ensure these requirements are followed and notification is provided when needed.

6.2. All Staff Responsibilities

It is the responsibility of all staff to comply with all laboratory internal and external procedures as defined by this document, and as applicable to their role activities, and to:

- ✓ follow project requirements as delineated by PMs to ensure analyses and commitments, including TAT, are performed as requested;
- ✓ develop knowledge and understanding of the QAM requirements under which samples are handled and tested;
- ✓ notify the leadership team and/or QA Manager when QA problems arise;
- ✓ follow QA requirements as outlined in the QAM and SOPs;
- ✓ follow appropriate channels regarding modification of existing SOPs;
- ✓ maintain accurate electronic and written records that ensure full traceability of testing events
- ✓ follow record modification rules when corrections are needed to ensure the retention of original data;
- ✓ ensure that applicable data are included in each process in accordance with applicable SOPs;
- ✓ report all nonconformance to the leadership team and/or QA Manager and follow their instructions for resolution;
- ✓ follow appropriate protocols when the handling and testing does not meet criteria;
- ✓ apply integrity and professional judgment when dealing with analytical processes and laboratory operations;
- ✓ actively participate in and assist with nonconformance and/or corrective action investigations.

7. Resource Requirements

7.1. General

ALS - Stratford management has committed its full support to provide the personnel, facilities, equipment, and procedures required by this QAM. Staffing resources include chemists, technicians and support personnel. This represents a diverse group with varied educational backgrounds and experience but provides the comprehensive skills that the laboratory requires. During seasonal workload increases, additional temporary employees may be hired to perform specific tasks.

7.2. Personnel

Refer to ALS Corporate policy *Recruitment Management Guidelines* (Global Policies & Forms) for information on how hiring is conducted at ALS-Stratford.

The ALS - Stratford training program is defined in the SOP - *Training of Personal* (eQMS; ADMINTraining) and includes quality, technical, safety, computer security awareness and other training as described in this QAM.

ALS - Stratford managers are responsible to ensure that all staff training is initiated, completed, verified, and the proper training records are completed timely and submitted to the QA Manager for review and retention. All training events have records but the form required may vary, as defined in SOP - Training of Personal (eQMS; ADMINTraining).

Management communicates to personnel their duties, responsibilities, and authorities through the HR maintained job descriptions, this document, and additional roles, responsibilities, and qualifications found in SOPs or other internal communications (i.e. memos). Job Descriptions include requirements for education, qualification, training, technical knowledge, skills and experience and are available upon request to HR.

Records are maintained that contain a certification that the employee has read, understands, and is using the latest version of the management system documents relating to the employee's job responsibilities. These are called Change Acknowledgements and are stored either within the eQMS system or on the ALS - Stratford server.

The specific training and experience of laboratory personnel is documented in individual training files maintained in accordance with SOP - Training of Personal (eQMS; ADMINTraining) and includes records of analytical proficiency through the analysis of QC samples (also called demonstration of capability or DOC).

All ALS - Stratford staff assigned to perform tasks affecting or relating to testing receive training relative to pertinent areas of responsibility, both prior to performing work on client samples and on an ongoing basis. Such training comes from internal and external sources. Each employee is supervised to the extent required to ensure adherence to the management system and ALS policies. It is the responsibility of the supervisor to authorize staff to perform specific laboratory activities, prior to handling and/or testing client samples. The supervisor monitors the competence of personnel throughout the course of work and performs an annual performance review.

Position	Education	Experience
Lead Technical Director[7] (may be named Laboratory Director or Laboratory Supervisor for state requirements)	Bachelors degree in biology, chemistry, or closely related field plus 30 college credits in chemistry.	3 years in an environmental lab, 24 months chemical analysis of representative organic and inorganic methods supervised
Technical Director - Chemistry	Bachelors degree in biology, chemistry, or closely related field plus 30 college credits in chemistry.	2 years in an environmental lab, 12 months chemical analysis of representative organic and inorganic methods supervised
Quality Manager	Bachelors degree preferred	Have documented training and/or experience in QA/QC procedures and the laboratory quality system. Have a general knowledge of analytical methods in use in the lab.
Instrumentation Analysts	High school diploma plus 8 college credits in chemistry	none
Analysts	High School diploma	none

[7] May be named Laboratory Director or Laboratory Supervisor for state requirements.

8. Facilities and Environmental Conditions

The ALS-Stratford facility features over 23,000 square feet of laboratory and administrative workspace (see APPENDIX D – LABORATORY FLOOR PLAN).

To maintain facility security and thus sample security, entrance to the ALS - Stratford facility can be attained only through security access using a key-tag proximity reader. The exception is the sample receiving entrance, where the doors are unlocked during normal business hours (approximately 8AM to 5PM EST). Entrance is monitored by Sample Receipt Technicians at the sample receiving entrance. All non-employees are required to sign-in at the main entrance and complete a HSE introduction to the site.

Refer to ALS Corporate Policies *Facilities Fit Out and Refurbishment Minimum Sustainability Standards*, *Environmental Policy*, and *Physical Security and Asset Management Standard* (Global Policies & Forms) for additional requirements.

The laboratory accommodations and environmental condition design provides safeguards against cross-contamination of samples and is arranged according to work function, which enhances the efficiency of analytical operations.

The ventilation system has been specially designed to meet the needs of the analyses performed in each workspace. The organics extraction area is physically separated from the Volatile instrument area and the Volatiles instrument room is positively pressured to minimize cross contamination. Samples suspected of containing high concentrations of analytes are isolated from other samples. Standards and reference materials are stored separately from samples, extracts, and digestates. ALS - Stratford further minimizes laboratory contamination sources by employing janitorial staff to ensure good housekeeping. Facilities maintenance is performed by qualified contractors.

Each area in the laboratory has adequate lighting, temperature control, bench space, access to sinks, hot and cold water, reagent water, gasses, suction, electrical outlets, chemical storage, fume hoods, ventilation, eyewashes, fire extinguishers, and aisle space as needed for instrumentation, safety, and for the processes assigned to that area.

Room temperature is monitored through digital temperature recording devices capable of sending alert notifications for results that are out of compliance to designated roles. These devices take measurements every minute and upload to a cloud storage where results are retained and can be graphically displayed over any desired time period and evaluated.

Fume hoods have visual indicators to ensure flow is maintained during use and are performance tested semi-annually.

All safety inspection records are kept on file for a minimum of five years.

Records are maintained for the requirements and conditions necessary for method and regulatory compliance in the facility.

Records are retained with analytical data for monitoring and control of environmental conditions relevant to method and regulatory specifications.

9. Equipment

The term “equipment” includes but is not limited to measuring instruments (also called analytical instruments), software, reference standards, reference data, consumables, and auxiliary apparatus that are required for the correct performance of laboratory activities and that can influence the client testing activities.[8]

A comprehensive list of major instrumentation, support equipment, and associated computer hardware and software utilized at ALS can be found on the laboratory’s intranet at \\nastrws003.corp.alsglobal.org\007 - Quality Assurance\Stratford QA\9000 - Admin\Equipment List and Records\Stratford Equipment List. The date of last update is included in the file name. This is a secure location that is only accessible by authorized roles and is maintained by the QA Manager.

The testing SOPs detail the equipment, reagents, standards, and consumables needed for performing the testing activity. These include specific requirements for instrument configuration and specification tolerances and include requirements for initial demonstration of capability (DOC). Most support equipment procedures are defined in this document, but additional requirements for specific testing activities are defined in the related testing SOPs. In cases where the instructions in this document may contradict each other, the testing SOP is followed.

All equipment must be verified to meet the specifications prior to being used for client testing activities. Only roles trained to conduct equipment verification, calibration, and/or maintenance are required to be familiar with those procedures listed in this section and require training records prior to completing these activities.

[8] The ISO/IEC 17025:2017 standard includes reference materials and reagents in “equipment”. This quality manual separates the reference material and reagent requirements as these are usually in liquid form and have different requirements.

Equipment received from other ALS laboratories or other second-hand sources must be treated as new to the site and undergo the same requirements for initial use and setup as new equipment.

Reference material and other solution requirements are indicated in Section **10.**

9.1. Equipment Labelling

All equipment is labelled with the unique ID and the following as appropriate:

- date of last calibration and/ or 3rd party service,
- expiry date for current calibration and/or 3rd party service,
- restrictions on use to a specific testing application or department,
- frequency of calibration verification (critical for support equipment), and
- initials for person creating and applying the label.

If a full ID is not possible, then at least the label must contain the unique equipment ID. The calibration, verification, or service information must be placed on the case for the item or in a prominent location in either the testing area (as a poster for example) or maintenance log. Analytical roles must be trained in where to find the information and alerted to the need to verify non-expired condition prior to each daily use.

9.2. Initial Set-Up and First Time Use

Upon arrival to the site, and prior to first time use, all equipment is assigned a unique laboratory ID and added to the equipment list. This is done by the QA Manager or designated alternate roles.

The following information is entered into the equipment list according to the column headings. Some information is optional and for User information purposes only:

- Equipment ID
- Equipment Name
- Description
- Equipment Type (selected from a drop down list of options)
- Department that will be responsible for maintaining the equipment
- Location
- Serial Number
- Manufacturer
- Model Number
- Receipt type (new, relocated internally, used, internal transfer)
- group type (A = basic equipment with measuring capability but not requiring calibration or verification; B = support equipment requiring calibration / verification; C = analytical equipment that requires full demonstration of capability)
- received date
- used for description (optional)
- commissioning requirements (associated with group type but opportunity to include specific testing SOP reference or additional User instruction)
- commissioned date
- commissioned by
- cleaning, maintenance, and hazard instructions (optional)
- other requirements (optional)
- equipment manual reference, manual date, and location (optional; also found on the eQMS External Documents)
- software version information
- formation version information
- service contract and agent information (optional)

All equipment must be verified to meet in-use specification tolerances after accounting for measurement uncertainty prior to use in client testing activities.

Where metrological traceability is required for linking calibrations to the International System of Units (SI), reference standards with ISO/IEC 17025 certificates or reference materials with ISO/IEC 17034 certificates are used.

Analytical instruments must meet SOP demonstration of capability requirements for first time use prior to testing client samples. Where appropriate, analytical instruments must have an initial MDL/LOQ study completed prior to use in testing client samples.[9] Assessment of capability can be done by the QA Manager, appropriate Department Lead, Technical Director, or other qualified role as demonstrated by training records. Specific acceptance criteria and method settings are defined in the testing SOPs.

Support equipment calibration and verification procedures are found within this document in the following sections.

At a minimum all equipment must be shown to operate satisfactorily through the successful analysis of a method blank made in the matrices that will be used by the equipment (demonstrates no contamination) and a spiked matrix blank (demonstrates ability to identify the analyte(s) of interest). Acceptance criteria for the spiked matrix blank are defined in the testing SOPs.

9.3. Equipment Manuals

The instrument manuals are provided in electronic format usually in the software programs, CDs, and available on network drives.

Software is controlled through licensing and is the responsibility of computer support to maintain licenses required.

Hardcopy manuals for older instruments are kept near the instrument or on a shelf designated for equipment manuals and are controlled by the QA Manager.

External references are maintained and available on the eQMS External Document Library.

9.4. Safe Handling, Transport and Storage of Equipment

All equipment is handled, transported, and stored as per the manufacturer's instructions.

When this is unclear than the Technical Director, QA Manager or Laboratory Director are consulted.

If it is desired to use equipment outside its intended use or specification, permission must be obtained by the Technical Director or Laboratory Director. This permission must be recorded in the maintenance log for the equipment with justification and conditions of use and acceptability defined.

9.5. Out of Service

Equipment that has been subjected to overloading or mishandling, gives unsatisfactory results, or has been shown to be defective or consistently outside specified tolerances must be taken out of service.

All out of service equipment must have an "out of service" label that includes the date and initial of the person authorizing the out of service condition.

This condition is recorded in the equipment maintenance log.

If the equipment was used while out of service for client testing activities, the Technical Director or designee is responsible for conducting a review of data to ensure that client results were not impacted. The control of nonconforming work is initiated.

Equipment must pass requirements for first time use before it can be returned to service for client testing activities.

If method settings changed, calibration was updated, or other changes were made that impact the determination of client results, initial MDL/LOQ studies are required.

9.6. Equipment and Maintenance Records

Records of equipment are retained through the equipment list (see Section **9.2** for list of information retained).

All equipment that is critical to the generation of client results must have a maintenance log to record:

- routine maintenance as defined in the testing SOPs,
- changes to equipment settings, methods, or operating firmware (including software updates),
- error messages and successful correction,
- nonroutine maintenance and troubleshooting,
- out of service status and resolution actions,
- changes to equipment components and accessories including part and lot numbers and vendor information, and
- 3rd party service, re-calibration, and/or re-verification visits.

[9] ALS-Stratford follows the EPA *Definition and Procedure for the Determination of the Method Detection Limit, Revision 2* for all MDL studies.

It is the responsibility of the Testing Analyst to ensure that all maintenance is recorded in the appropriate maintenance log on the same day that the maintenance happens.

For **3rd party maintenance**, the Testing Analyst or Department Supervisor is responsible for reviewing the report and adding key information to the maintenance log such as:

- changes to parts and/or components and associated part/component[10] number and lots,
- method or firmware setting changes,
- re-calibration or re-verification date and associated expiry, which is also updated on the equipment label as appropriate, and
- software updates.

Retain the service report that is provided by the vendor. If this is provided on paper, submit the paper records to the QA Manager. If this is provided electronically, forward the electronic records to the QA Manager. The QA Manager will retain all 3rd party maintenance records in dedicated equipment folders on the secure quality network.

Maintenance logs are periodically reviewed for completion by the appropriate Department Leads. A full review is conducted during the method internal audit.

9.7. Calibrations and Verifications

All equipment verifications and/or calibrations are conducted by either 3rd party ISO/IEC 17025 accredited vendors or by trained internal staff.

All verifications and calibrations conducted internally use ISO/IEC 17034 certified reference materials or ISO/IEC 17025 calibrated reference standards and must be conducted by trained staff who have demonstrated capability.

Calibration and/or verification records are maintained by the QA Manager or through the testing activity data retention procedures (i.e. instrument data files) as defined by the testing SOPs.

Specific calibration and verification requirements for support equipment type are defined below.

When support or reference equipment is purchased with a 3rd party calibration certificate, these are reviewed and retained by the QA Manager, who ensures the following:

- calibration certificates must be provided from ISO/IEC 17025 accredited vendors,
- calibration certificates contain sufficient information to satisfy ISO/IEC 17025 reporting criteria for calibrations, especially metrological traceability,
- any correction factors must be noted and communicated to the users or information added to laboratory bench sheets and forms, and
- the provided measurement uncertainty must be evaluated to ensure that the equipment is still able to meet in-use specification tolerances.

9.8. Temperature Control Devices

Temperatures are monitored and recorded at least daily for all temperature-critical support equipment such as refrigerators, freezers, ovens, and incubators. Thermometers used for monitoring support equipment are called **working thermometers**.

Fridges, freezers, and incubators are equipped with a centralized temperature monitoring system from the 3rd party vendor TandD. This system uses digital temperature probes attached to display units that automatically record the temperature at periodic intervals and upload through wireless capability to a central server location. Authorized roles have access to the data. The unit display allows lab personnel to see the real-time temperature. The device thermometer probes are immersed in glycol / glycerin when used in refrigerators, freezers, ovens, and incubators.

Only the designated Administrator has rights to modify the alarm limits, add units and Users, and edit notification lists and schedules. Acceptance criteria:

Refrigerators	0 to 6 °C
Freezers	≤ -10 °C
BOD incubator	19 – 21 °C

[10] Component changes such as new autosampler, pump, injector, syringe, etc. must be updated and/or added to the ALS-Stratford equipment list. Similarly, software and firmware updates must also be retained on the ALS-Stratford equipment list. Notify the QA Manager of these component changes.

Out of specification condition alerts are monitored and actioned by the QA Manager, who is also responsible for alerting the impacted department(s) and initiating corrections to bring the impacted unit back into specification as per Section **9.7.4**. Customers are notified of catastrophic failure of storage equipment when their samples were potentially impacted by the PM.

Where the operating temperature is specified as a test condition for the testing activity, the temperature at time of testing is recorded on the batch testing bench sheets.

DAILY, all analysts must visually verify that the temperatures used with their testing activities are in working order and are operating within required specifications. Any deviations must be brought to the immediate attention of the Department Supervisor, QA Manager, and Technical Director and the control of nonconforming work initiated.

Thermometers in daily use to monitor support equipment and room temperature are verified annually. Verifications are conducted by trained staff using the site-maintained reference thermometers and records are reviewed and maintained by the QA Manager.

Whenever possible, working thermometers are purchased with calibration certificates with at least three calibration points covering the range of use (the mid-point should be within 10 degrees of the value of primary use). If working thermometers are purchased without calibration certificates, they must be verified against the appropriate reference thermometer prior to first use.

9.9. Reference Thermometers

The laboratory maintains reference thermometers specific to certain temperature ranges for the internal verification of all thermometers. These can be digital or liquid in glass. If using liquid in glass, there must be sufficient graduations in the range of use to allow measurements to the correct tolerance of the thermometer being verified.

Reference thermometers are purchased and calibrated by 3rd party ISO/IEC 17025 accredited vendors. Reference thermometers are re-calibrated every 3 years and are kept in the QA Manager's office to ensure they are not used for routine temperature monitoring. They are only used for thermometer verification and troubleshooting purposes at the discretion of the QA Manager.

The QA Manager is responsible for ordering and requesting the correct calibration conditions from the 3rd party vendor when ordering initial or re-calibration reference thermometers. The reference thermometer must be calibrated using at least 3 or more points to cover the range of the thermometer and have sufficient points within the range of use. At a minimum include the low and high point on the thermometer range plus at least one point in the range used for thermometer verifications at the lab. If there are multiple temperature points used for thermometer verifications by a single reference thermometer, then add a calibration point for each value that is more than 10 degrees from a point already used in the calibration.

If the reference thermometer certificate indicates that there is a correction factor, this value is applied to all subsequent verifications. The temperature of the verified thermometers will be evaluated after incorporating the correction factor into the original observation and applying the appropriate acceptance criteria as defined by the testing activity.

9.10. Support Thermometer Verifications

Thermometers used for monitoring support equipment (called working thermometers) are verified annually using the appropriate reference thermometer[11]. Verifications are performed by trained staff and records are maintained by the QA Manager.

Prior to conducting the working thermometer verifications, the reference thermometer is verified to still be in working order with an ice point check[12]. Follow these steps:

- Prepare a bucket of ice with just enough reagent water to reach the immersion point of the thermometer.
- Immerse the reference thermometer as per manufacturer's instructions and allow sufficient time for it to equilibrate until the reading has stabilized (no change for at least 1 min).
  - It is ok to agitate as long as the reference thermometer is not compromised and taking a measurement is possible.
- Record the reading on the thermometer verification log.
  - Only a single reading is necessary.
- The difference between 0°C ice water and the reading of the reference thermometer must be zero or corrections must be conducted prior to repeating the verification procedure.
  - Corrections are recorded on the verification log and the verification is repeated.
  - If the verification has been repeated 3 times with failing results, the reference thermometer must be placed out of service and sent for re-calibration or replaced.

[11] Working thermometers may be liquid in glass, digital probes, Sensor Push devices, or infra-red (IR) devices.

[12] Reagent water is considered a pure material and is a reference material with metrological traceability by definition.

Support equipment thermometers are verified at the temperatures of use as follows:

1. Determine the number of readings required as follows:
   - Single point thermometers require verification at the temperature of use.
   - Thermometers used over a range of ≤10 °C are verified at a single mid-range point.
   - Thermometers used over a range > 10 °C require at least 2 points at the low and high range of use. A 3rd point in the mid-range is optional but recommended.
   - Freezers used for storage of samples and standards only need to ensure the temperature is freezing and therefore only a single point verification is required.

2. Inspect the working thermometer for any defects such as bubbles within the liquid-in-glass column, breaks, bends in the digital probe that compromise function, display issues, etc.
   - If there is separation in the liquid, attempt to correct by slowly heating or freezing the thermometer, being sure not to exceed the maximum range of the device, which can cause breakage.
   - If separation cannot be resolved, the working thermometer must be placed out of service. The Department Supervisor, QA Manager, and Technical Director must be notified and must conduct an impact to data quality and the control of nonconforming work process initiated.

3. Set up a common vessel for conducting the verification depending on thermometer type:

   - For **electronic thermometers** verify the batter charge (if possible) and replace the battery.

   - Immersible thermometers are placed in a liquid (reagent water, oil, or solvent) at a temperature similar to the one for which the thermometer will be used to the correct immersion depth. The reference thermometer must also be immersed in the liquid to the correct immersion depth.

   - For **digital thermometers on the TandD system**, place another vial of glycol in the fridge immediately next to the sealed glycol working probe. Place the reference thermometer in the vial.

   - For **IR devices**, fill bottles with reagent water adjusted to the appropriate test temperature and place the reference thermometer in the bottle.

   - For **oven or muffle furnace thermometers**, place the working and reference thermometer in the same vial of glass beads in the oven of use.

4. In all cases, allow sufficient time for the working and reference thermometers to equilibrate until the readings do not change for at least 30 seconds.

5. Record the readings from both the working and reference thermometers in the log. Complete all other required information for record traceability as per log fields. At a minimum this must include date, initials, thermometer IDs, identification of measuring medium (including Lot # if applicable) and associated equipment ID, results, and evaluation of pass/fail with indication of corrective action for failures.

6. Assign any correction factors from the reference thermometer to the working thermometer and record adjusted readings in the log.

7. Calculate the difference in results between the reference thermometer and the working thermometer.

8. Apply the following acceptance criteria:

   - If the difference is <2 °C, and the devices allows the application of an offset, adjust the offset so that the working thermometer reads the same as the reference thermometer. The thermometer is re-calibrated. Record this action.

   - If the device does not allow offsets, determine the correction factor needed to get the working thermometer to make it match the reference thermometer. The thermometer is re-verified. Record this value on the log.

   - If the difference is >2 °C the working thermometer requires correction to bring it into alignment with the reference thermometer. Repeat the verification procedure after corrections completed.

     - If after 3 repeated verification attempts the results are the same, the working thermometer must be placed out of service and either sent to 3rd party for repair or replaced.

9. Create a new equipment label for the working thermometer. Ensure it includes the thermometer ID, date of verification, verification expiry, and the correction factor (if any). Apply the label to the working thermometer.

10. Submit records and reference thermometer to the QA Manager for review and retention.

9.11. Verification of Equipment with Integrated Temperature Controls

This section only applies to equipment in which temperature controls are integrated in equipment used for sample preparation such as soxtherns, evaporators, cyanide blocks, muffle furnace, ovens, etc. It does not apply if the testing activities are already being monitored with an externally calibrated thermometer, such as those placed in the heat block for sample digestion (i.e. metals), if the oven / incubator has an internal separate thermometer, some COD blocks, etc.

Such equipment must be calibrated or verified annual at the temperature of use or immediately if the equipment is thought to be out of tolerance.

Place the reference thermometer in the same vessel used for samples but in a different matrix (reagent water, oil, sand) to avoid damage to the thermometer. If the reference thermometer cannot be used due to potential damage, a verified IR device may be substituted. Conduct the verification as per Section **9.7.2**, making appropriate modifications for the different testing setup and doing the same record retention process.

For equipment such as the muffle furnace or kiln that have very high temperatures, verify these equipment with certified temperature indicating fluid or devices. Use the same record retention process as Section **9.7.2.**

When verification is not possible, due to extreme temperature or possible damage to the reference thermometer, or the device is closed preventing use of IR devices, the verification is done indirectly through the successful analysis of appropriate spiked quality control samples or certified reference material of known value. The acceptance criteria for success is defined in the testing SOP.

9.12. Corrective Action for Out of Specification Alerts from the TandD or Sensor Push Devices

The QA Manager is responsible for monitoring the temperature data for the support equipment using the TandD digital system. When there is an out of specification event the following is done:

Scenario	Correction	Required Record (done by QA Manager)
temperature returns to control in ≤ 2 hours	• observe the long-term trends for the unit 1. If it is likely that this is due to usual day use (door open for sample input / removal or regular cycling to prevent icing of the coils) do not make adjustments to unit settings. This is concluded if the temperature failures are always during working hours. No corrections are necessary. 2. If there is indication of long-term trends outside of normal working hours or other unusual failures, re-verify the device as per Section 9.7.2. Place another device on the equipment requiring temperature monitoring.	• Option 1: enter comment on the log indicating the failure was recognized and deemed not-significant. • Option 2: initiate control of nonconforming work and enter the CAR number on the log. Ensure the equipment lists and maintenance logs are updated with the change in temperature monitoring device and any out of service conditions.
temperature fails to return to control in ≤ 2 hours	• Lab personnel must confirm that the door is firmly closed and that there is power to the unit. • Lab personnel must confirm that the regulator coils are not frozen or clogged with dust and that drains are working properly. • Lab personnel must confirm that the failure is not due to a faulty thermometer. If the unit appears to be operating as expected, replace the thermometer with another verified thermometer and allow the temperature to stabilize so that the reading does not change for at least 30 seconds. If the temperature meets acceptance criteria, no impact to samples or standards has occurred. Continue using the replaced thermometer while the failed thermometer is re-calibrated as per Section **9.7.2**. Update appropriate equipment maintenance logs and equipment lists and notify the QA Manager. • If failure is confirmed to be non-thermometer related, samples or standards are immediately removed to other in-control units. • In all instances of non-thermometer failure, the Department Supervisor or Technical Director or designee assess impact to any client samples or standards. If the samples have been out of temperature for long enough to impact data integrity, the PM is responsible for alerting the client and getting client direction for next steps. Compromised standards are disposed and replaced with in-control lots.	• If the failure was due to faulty thermometer, enter a comment on the log to capture the change in thermometer to the working one and initiate control of nonconforming work for the faulty thermometer. Enter the CAR number on the log. • If the failure was due to faulty unit, enter a comment on the log indicating the out of service condition of the equipment and what was done to client samples or standards potentially impacted. Initiate the control of nonconforming work and enter the CAR number on the log • In both cases, update impacted equipment lists and ensure the maintenance log has been updated to reflect the change.

Scenario	Correction	Required Record (done by QA Manager)
	• Trained personnel may make changes to the unit's temperature settings if appropriate. If the temperature returns to acceptable range within 2 hours, no further correction is needed. If samples or standards were moved, they may be returned. • If after adjustments or other corrections the unit still remains out of control, it must be placed out of service while more aggressive corrections are attempted (3rd party maintenance or replacement).	

9.13. Balances

Balances are calibrated annually by 3rd party ISO/IEC 17025 accredited vendors. These Vendors conduct annual maintenance on the balances at the same time since it is required that calibration and maintenance be conducted on site. Balances are not shipped away for these activities. When balances are initially purchased and set-up at the site, the 3rd party vendor also performs initial calibration.

3rd party calibration and maintenance records are retained by the QA Manager. All records are reviewed to ensure that:

- accreditation to ISO/IEC 17025 for the vendor is current;
- scope of accreditation covers the calibration of the balances at ALS-Stratford;
- weights used in the calibration have metrological traceability and are of the appropriate type (ASTM Class 1 or better);
- sufficient measurements have been recorded to bracket the range of use for the balance with sufficient measurements taken in where sample measurements are determined (at least one);
- review the measurements for "as found" and/or "as left" failures. If identified, initiate control of nonconforming work as defined below; and
- initial and date the record to capture the review was completed and deemed acceptable.

"**As found**" failures require initiation of control of nonconforming work and investigation is conducted to determine possible impact to testing activities[13]. The QA Manager is responsible for conducting these investigations. Record the CAR number on the calibration record. Review the failure against ALS-Stratford acceptance criteria, and:

- If the as found failure passes ALS-Stratford criteria, then there was no impact, and no additional correction is required.
- If the as found failure fails ALS-Stratford criteria, then the Technical Director or designee must conduct an impact to client testing activities that were performed in the past. A review of the daily verification records is required. Observations and conclusions are captured in the CAR. If the "as left" condition passes, the balance may continue to be used. However, refresher training on the use of the balance may be required at the discretion of the Technical Director or designee. If the "as left" condition fails, the balance must be immediately removed from service until the condition is resolved.

The acceptance criteria for the weight measurements are the same as those used for the daily balance verifications and are found in Section **9.9.**

9.14. Daily Balance Verification and Verification Weights

Verification weights are ASTM Class 1 weights purchased from a 3rd party ISO/IEC 17025 accredited vendor and are purchased with metrological traceability certificates that are retained by the QA Manager. The QA Manager is responsible for reviewing the weight certificate by:

- ensuring the accreditation to ISO/IEC 17025 for the vendor is current;
- ensuring the scope of accreditation covers the calibration of the weights;
- evaluating the measurement uncertainty of the weights to ensure they are still appropriate for use in testing activities;
- verifying the metrological traceability;
- adding an initial and date to the record to capture the review was completed and deemed acceptable. Any nonconformances are flagged and addressed through the control of nonconforming work process.

Calibration of all balances is verified DAILY by testing Analysts, prior to using the balance for client samples. The steps are:

[13] The acceptance criteria of 3rd party vendors is usually less tolerant than needed for environmental testing activities. If possible, request the vendor use ALS-Stratford acceptance criteria before calibrations are conducted.

1. Brush of the balance pan with a clean brush dedicated for that purpose.
2. Check the bubble level to insure the balance is levelled
3. Press the zero bar on the balance; make sure the readout indicates the balances is zeroed or tared.
4. For specific applications – if the critical weight of a test is always in a specific vessel (beaker, dish, etc.) the balance must be tared with a clean vessel on the pan and weight verifications should be made into the vessel.
5. Measure and record the ASTM Class-1 verification weights most appropriate for the balance capacity. This will be indicated in the Daily Balance Verification Log assigned to the balance. Be sure to complete all appropriate fields in the log.
6. Remove each weight and re-zero before performing the next measurement.
7. Repeat steps 5 and 6 for each required ASTM Class-1 verification weight. Required weight mass and number of verifications is indicated in the specific balance log.
8. Compare the measured weight to the acceptance criteria in the table below. If a failure occurs do the following as appropriate to the situation and record actions in the log:
    a. inspect the balance for foreign matter under the pan, outside air currents, or movement of the balance table that (both may cause interference with the readings)
    b. recalibrate the balance with internal ASTM Class-1 weights
    c. if neither steps a or b return the balance to service, take the balance out of service and arrange for 3rd party maintenance and initiate the control of non-conforming work process. The Technical Director or designee is required to determine potential impact to testing activities and include that in the CAR response.
    d. if a and/or b return the balance passing condition, record the corrections taken on the balance log and no further actions are needed.

Acceptance Criteria for Daily Balance Verification[14]:

Analytical Balance Resolution = 0.0001 g or - 0.00001 g	Tolerance	Acceptance Range
0.002 g	±0.0002 g	0.0018g – 0.0022 g
0.2 g	±0.0004 g	0.0996 – 0.1004 g
0.5 g	±0.0010 g	0.4990 - 0.5010 g
1.0 g	±0.0010 g	0.9990 – 1.0010 g
10 g	±0.0100 g	9.9900 – 10.0100 g
20 g	±0.0200 g	19.9800 – 20.0200 g
100 g	±0.1000 g	99.9000 – 100.1000 g
Top Loading Balance Resolution = 0.01 g or - 0.001 g	**Tolerance**	**Acceptance Range**
0.1 g	±0.02 g	0.08 – 0.12 g
0.2 g	±0.02 g	0.18 g – 0.22 g
1.0 g	±0.02 g	0.98 – 1.02 g
10 g	±0.20 g	9.80 – 10.20 g
20 g	±0.40 g	19.60 – 20.40 g
100 g	±2.00 g	98.00 – 100.20 g

The calibration of the weights is verified annually immediately after the balance calibration is completed by the QA Manager or designee. This enables comparison to the same NIST traceable weights that were used in the balance calibration. The balance used for this

[14] The acceptance criteria on the balances that have higher resolution then displayed in the acceptance criteria will add a zero at the end of the number to account for the significant figures.

verification must have at least 0.0001 g resolution. For the heavier weights, do not exceed the max range of the 0.0001 g balance and instead use a balance with 0.001 g or 0.01 g resolution as appropriate.

The QA manager completes and retains the annual weight verification records.

If a weight fails verification, the control of nonconforming work is initiated, and an impact to testing activities is conducted by the Technical Director or designee. The QA Manager will implement immediate correction by cleaning the weight with an appropriate solvent to remove any oils or residue and will attempt re-verification[15]. If the re-verification passes, the weight is cleared for subsequent use. If the re-verification fails, then the weight is removed from service and additional corrections are required.

Acceptance Criteria for the ASTM Class-1 Weights[16] Annual Verification:

mass	Tolerance	Acceptance Range
0.002 g	±0.0005 g	0.0015g – 0.0025 g
0.1 g	±0.0005 g	0.0995 – 0.1005 g
1.0 g	±0.0010 g	0.9990 – 1.0010 g
10 g	±0.0100 g	9.9900 – 10.0100 g
20 g	±0.0200 g	19.9800 – 20.0200 g
100 g	±0.1000 g	99.9000 – 100.1000 g
200 g	±0.2000 g	199.8000 – 200.2000 g

9.15. Volumetric Devices

The procedures for volumetric devices, including the calibration verification, are found in the external reference from ALS-Rochester *Mechanical Volumetric Dispensing Devices, Volumetric Labware, and Non-Volumetric Labware* found on eQMS; RS-ADM-PCAL. Only those processes that differ slightly due to site differences are explained. All record keeping, maintenance, and training procedures described in RS-ADM-PCAL apply to ALS-Stratford. LIMS practices will differ since ALS-Rochester uses StarLIMS and ALS-Stratford uses Element, and ALS-Stratford is not maintaining equipment information in Element.

The QA Manager is responsible for retaining all suppled certificates of accuracy. When not supplied in paper format, the certificates must be downloaded for the appropriate lot numbers in use at the laboratory from the vendor websites and retained.

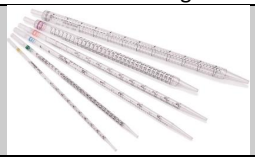
Frequency of calibration verification for volumetric Devices[17]:

Volumetric Device	Description	Verification Frequency	Procedure
Class A Glassware	must have an "A" clearly displayed on the glassware and reference to ASTM E694.	before first time use and then for troubleshooting purposes only	• routinely check glassware for any scratches or corrosion that will impact the accuracy of the volume • first time verification follow RS-ADM-PCAL
Class A glass microliter syringes		must come with certificate of accuracy for Class A status and then are exempt	• routinely check glassware for bubbles within column, bent plunger, or corrosion that may impact the accuracy of the volume • damaged syringes are immediately put out of service
Pipettor	may be fixed single volume or adjustable, single or multi-channel	quarterly	follow RS-ADM-PCAL

[15] It is critical that the correction happens immediately prior to alerting the Technical Director of the failure to ensure that the balance conditions do not change.

[16] The acceptance range for the weights is listed to 4 decimal places assuming a 4 resolution balance is used. If a top loading balance with less resolution is used, then the values are adjusted accordingly, as long as only zeros are removed. The top loading balance must have sufficient resolution to measure to the non-zero numbers after the decimal.

[17] The devices used at ALS-Stratford may have a different manufacture brand and appearance.

Volumetric Device	Description	Verification Frequency	Procedure
Re-pipettor Dispenser	may be fixed or adjustable volume	quarterly	follow RS-ADM-PCAL
Repeater	has different syringe attachments	quarterly	follow RS-ADM-PCAL
Class B glassware, volumetric[18]	Has a "B" on the glassware or no label letter at all. Anything without an "A" label. Will have volume graduations indicated.	prior to first use by lot (one per lot) annually thereafter	follow RS-ADM-PCAL
Single use or disposable pipettes		prior to first use by lot (one per lot)	follow RS-ADM-PCAL
Non-volumetric	may or may not have volume graduations present examples include: disposable pipettes, specimen cups, scintillation vials, GC vials, Nessler tubes, etc.	prior to first use by lot (one per lot) annually thereafter	follow RS-ADM-PCAL

9.16. Water Purification System

ALS - STRATFORD uses **Hydro Service and Supplies** water purification system to produce reagent water meeting method specifications. The system consists of a series of pumps, filters, and resin beds designed to yield water meeting the specifications of ASTM Type II water, and *Standard Methods for the Examination of Water and Wastewater* (SM1080, 20th Ed.) *High Quality* water. The system is maintained by Hydro.

9.17. Reagent Water Daily Verification

Daily, the conductivity and pH of the ALS-Stratford reagent water are measured by a trained Analyst. The results are recorded in a dedicated log.

The Analyst must alert the Wet Chem Department Supervisor, Technical Director, or QA Manager if the conductivity is > 1 $\mu\Omega/\text{cm}$ or pH is outside 4.4 – 7.5. Such instances require initiation of control of nonconforming work and the Technical Director or designee must conduct an evaluation of impact to testing activities.

9.18. Spectrophotometers

The calibration of the spectrophotometers is checked annually by a 3rd party. These records are reviewed and maintained by the QA Manager. Any deviations for "as found" conditions must be escalated to control of nonconforming work. The event is logged in the equipment maintenance log.

9.19. Timers

Timers are purchased with ISO/IEC 17025 calibration certificates to ensure traceability to the SI through NIST.

[18] The use of Class B graduated cylinders and volumetric flasks are not allowed at ALS-Stratford when such use is critical to the client testing activity. Such glassware is appropriate only for use as a holding or transfer of material that is not being volumetrically measured.

Since timers are used in the laboratory to alert testing Analysts when the required amount of time has elapsed for a step in a test, or other support activity, the exact seconds are not critical for any activities conducted at ALS-Stratford.

As decreasing battery strength is known to cause time drift, the Timer labels are made to include the date of last battery replacement. Batteries are replaced at least annually to prevent such drift. Labels are updated with the new battery replacement due date.

When it is noted that a timer is behaving oddly and replacing the battery does not fix this, it is removed from service and replaced with a new certified timer.

Through measurement uncertainty assessment, time differences of seconds do not have impact on the outcome of the result for any testing activity conducted at ALS-Stratford. For this reason, timers are not calibrated after they are put into service and do not have a defined expiration period. If a timer is received with an expiration date, the sticker is removed.

10. Metrological Traceability

All measurements made by the laboratory require traceability to SI through national metrology institutes such as NMI or NIST. This is accomplished through the use of Reference Standards or Reference Materials.

a) Reference Standards

Reference standards used by the laboratory are calibrated at determined intervals by outside vendors for the following equipment. These reference standards are maintained under the control of the QA Manager and are used for verifying intermediate materials used by the laboratory. The QA Manager is responsible for maintaining records and schedules of calibration. Additional procedures are described in the previous section.

- Reference Thermometers
- Reference Weights
- Intermediate checks are used in the laboratory to verify performance of support equipment and are verified to traceable reference standards. Records of such verifications are retained by Quality Assurance.

b) Reference Materials

Reference materials used at ALS - STRATFORD must be of the grade or quality specified by the pertinent analytical procedure or methodology. This is defined in the applicable testing SOPs.

Purchased reference materials must be traceable to the SI through NMI or NIST where possible and have a certificate indicating compliance to ISO/IEC 17034 whenever applicable.

All reference materials must be labelled with (some may be already on the label supplied by the manufacturer):

- standard name,
- analyte concentration,
- solvent,
- date received, prepared, and/or opened,
- storage conditions,
- preparer initials, and
- expiration date;

At time of receipt this information is entered into LIMS and LIMS assigns are reagent unique ID. This is printed and applied to the original container.

All working standards prepared from reference materials are required to have this information and are also logged into LIMS and assigned unique reagent ID from LIMS that is printed and applied to the container. When an amount is prepared that is split into separate aliquots, these are also assigned IDs by LIMS so that the tracking is specific to the lot and aliquot. Preparation information is entered and retained in LIMS.

Internally prepared reagents and chemicals are labelled with the LIMS generated label and must include:

- date of preparation
- expiration date
- preparer's initials
- unique assigned LIMS ID

Any paper received certificates are forwarded to the QA Manager who is responsible for retaining them. When only digital ones are available, these are downloaded from the vendor and retained by the QA Manager.

Second source reference materials are purchased and used in the testing process as an independent verification of primary reference materials. The secondary reference material does not require accredited vendors.

Prior to introduction into the analytical system/process, reference materials are verified for accuracy with a second, independent source of the material. In addition, the independent source of reference material is also used to check the calibration standards for signs of deterioration.

All standards, reagents and reference materials shall be stored per analytical SOP requirements to ensure their integrity. Safe handling and transportation of these materials are discussed in the respective analytical SOP and/or Laboratory Safety Manual.

Standards and reference materials are stored separately from samples, extracts, and digestates.

Any reagents, standards, reference materials, or chemicals that are not stored as per requirements or look otherwise compromised or degraded must be verified by a second source prior to continued use or discarded. Acceptance criteria are defined by the appropriate testing SOP. Once re-verified a new label is applied.

No reagents or chemicals are used past the expiration date. The expiration date of a reagent or standard cannot be extended by preparing a dilution of it or combining it with other standards or reagents.

The expiration date of any prepared reagent cannot exceed the expiration date of the parent stock. Any prepared solutions that are from multiple stocks must use the expiry date that occurs the earliest.

When the expiration date is not provided by the manufacturer, first check the appropriate testing SOP and implement that requirement. If there is no expiration guidance in the testing SOP apply the following:

Reagent / Chemical Description	Expiration Date
purchased neat reagents	5 years after receipt
inorganic reagent solutions	1 year from preparation or receipt
organic reagent solutions	6 months from preparation or receipt
purchased neat standards	5 years from receipt
titrants	30 days from preparation or receipt or sooner if specified in testing SOPs
metal stock standards solutions	10 years from preparation or receipt
metals secondary, intermediate, or working standard solutions	1 year from preparation or receipt
mercury stock standard solutions	1 year from preparation or receipt
mercury secondary, intermediate, or working standard solutions	1 month from preparation (note calibration standards are prepared daily)
inorganic stock standard solutions	1 year from preparation or receipt
inorganic secondary, intermediate, or working standard solutions	6 months from preparation or receipt
volatile organic stock standards (lab prepared)	1 year from preparation
volatile organic stock standards (purchased unopened ampules)	1 year from receipt
volatile organic stock standards (purchased opened ampules)	3 months from opening date
all volatile organics secondary intermediate or working standards	• common “gases” = 7 days • ≤ 200 mg/L = 1 month • > 300 mg/L = 3 months Standards used for calibration should not be older than 7 days
purchased semivolatile organic stock standard solutions	1 year from receipt
prepared semivolatile organics stock standards	1 year from preparation
semivolatile organic secondary, intermediate, or working standard solutions	6 months from preparation or receipt

If a standard or reagent is used beyond its expiration due to accident or unforeseen circumstances:

- implement the control of nonconforming work procedure
- note the discrepancy on the applicable batch bench sheet and in LIMS
- For standards, verify the standard against a second source (this can be a newly prepared standard).
    - analyze both old and second source on the same instrument within the same analytical batch and sequence
    - if the results are within 20 RPD, data associated with the expired standard is acceptable
    - if the results are not within 20 RPD, reanalyse all samples associated with the expired standard if possible

- For reagents, review the batch QC and check the LCS or other positive QC.
    - if results are within acceptance criteria, no further action is required
    - if results are not within acceptance criteria immediate halt sample analysis and re-analyze samples if possible
- In both cases:
    - If data is already released, client notification is required by the PM.
    - If reanalysis is not possible, client must be notified by the PM and if data is released it must be qualified.

11. Externally Provided Products and Services

11.1. Subcontracting

Although ALS has a network of laboratories with overlapping accreditations, each location is considered "external" for the purposes of subcontracting. Therefore all internal transfer of samples is considered "subcontracting" and must follow the requirements of this document.

Analytical services are subcontracted when the laboratory needs to balance workload, when the requested analyses are not performed by the laboratory, or the requested analyses are currently under internal suspension due to unsatisfactory PT performance.

Subcontracting is only done with the knowledge and approval of the client and to qualified laboratories[19]. Subcontracting to another ALS laboratory is preferred over external-laboratory subcontracting. The PM is responsible for ensuring the client testing is covered under the subcontracting lab's scope of accreditation.

ALS - Stratford accepts responsibility to the customer for the subcontractor's work unless the customer or a regulatory authority specified which subcontractor was to be used.

Turnaround is the responsibility of ALS-Stratford and all efforts must be made to rapidly facilitate subcontracting to maximize client service and meet client needs. This includes requesting the subcontracting analysis under "rush" priority and doing what is necessary to facilitate this with the subcontracted laboratory, including advance communication and sending CoCs ahead of the samples to facilitate pre-login.

PMs are responsible for notifying clients in writing that a portion or all of their sample analysis will be subcontracted and which laboratory will be performing what analysis. The PM must contain the written consent from the client PRIOR to sending samples to the subcontracted lab.

The PM or designee is responsible for contacting the subcontract laboratory and communicating the client project requirements and for establishing contractual terms and conditions as necessary, including required turnaround time. Any client specific testing and/or handling requirements must be communicated.

The PM or designee is responsible for ensuring that the external, non-ALS, subcontract laboratory has the required insurance coverage as specified by ALS Corporate. This is demonstrated by the subcontract laboratory providing a certificate of insurance indicating proper levels of coverage. The laboratory will represent that it now carries and it will continue during the terms of the contract to carry insurance in the minimum amounts required by ALS. This typically is:

- worker's compensation – statutory
- employer's liability
- providing a waiver of carriers subrogation rights against ALS, its officers, directors, employees, and affiliated companies
- commercial general liability bodily injury/property damage
- endorsement naming ALS as additional insured
- comprehensive automobile liability
- professional liability

The subcontracted laboratory must carry any additional insurance coverage in necessary amounts which may be required of statutory or other requirements.

ALS-Stratford client reports containing subcontracted information must clearly identify what results were generated by the subcontracted laboratory.

11.2. Procurement

[19] Qualified laboratories are those that have the required accreditation as required by the client for the analysis of the subcontracted samples.

ALS - Stratford SOP *Purchasing* (eQMS ADMIN PURCHASING) defines the process, evaluation, criteria and records maintained from the evaluation and re-evaluation of supplies and services.

Refer to ALS Corporate Policy Supplier Code of Conduct Policy (Global Policies & Forms) for information about expectations for our Vendors.

ALS - Stratford uses vendors which supply the level of quality required to perform testing activities and maintains a relationship with multiple vendors and uses vendors with comparable certifications or accreditations.

The quality level of reagents and materials (grade, traceability, etc.) required is specified in testing SOPs.

Refer to previous sections for requirements for supplies and ordering.

ALS-Stratford uses the network of vendors approved by the ALS Procurement support department. This department maintains a vendor list, negotiates contracts and pricing, and conducts vendor approvals.

12. Review of Requests Tenders and Contracts

ALS-Stratford SOP *Contract Review* (eQMS, ADMINCONTRACT) defines the procedures employees supply quotations and proposals to clients must follow. It ensures that:

- the client's requirements including the methods to be used are adequately defined, recorded, and understood,
- the laboratory has the licensing, capability, and resources to meet the clients requirements and testing needs, and
- the appropriate test method is selected and capable of meeting the client's requirements.

It defines the procedures for reviewing client requests and contracts and procedures for amendment of such items when required.

13. Selection, Verification, and Validation of Methods

13.1. Selection

Selection of methods is covered in the ALS-Stratford SOP *Contract Review* (eQMS, ADMINCONTRACT).

ALS - STRATFORD employs methods and analytical procedures from a variety of external sources such as ASTM, EPA, and Standard Methods (SM). The specific methods are defined on the maintained Scope of Accreditations (see APPENDIX F - Laboratory Accreditations).

Other published procedures, such as state-specific methods, program-specific methods, or in-house methods may also be used. When such methods are used for client testing activities, a qualifier is included with the result to clarify the testing is not accredited.

The implementation of methods by ALS - STRATFORD is described in the testing SOPs specific to each method.

ALS - STRATFORD maintains SOPs for use in both technical and administrative functions. An SOP is available for each accredited method. SOPs are written following standardized format and content requirements as described in the ALS-Stratford SOP *Document Management and Control* (eQMS, ADMINDOC). Refer to Section 25 Control of Management System Documents for more information.

All SOPs must be compliant with the related reference method or standard. When several methods are referenced in an SOP, all procedures must be compliant with all referenced methods. When there is a discrepancy in requirements, the more stringent requirement is implemented.

13.2. Modifications

Published methods may be modified as a result of the request of the client or operational conditions prevailing in the laboratory. Operational conditions might relate to, for example, the availability of equipment or the performance of the method as determined by calibration processes, detection limits, or the results obtained for quality control samples.

All allowed method modifications are outlined in the SOP and are based on reference method indicated allowances. In the event that an analytical method is modified to an allowed modification, the SOP documentation must include:

- a description of the modification,
- any justification for the modification, including method performance, recovery data, and any other supporting data, and
- approval from the Technical Managers, Quality Manager, and Laboratory Director through approval of the SOP as a whole.

In the event that an analytical method must be modified or is modified from the SOP to perform testing on specific sample matrices, the modification and reason must be stated in the case narrative.

When a customer requests a modification to an SOP (such as a change in reporting limit, addition or deletion of target analyte(s), etc.), the PM handling that project must discuss the proposed deviation with the Technical Director or designee and obtain their approval to accept the project. The PM is responsible for documenting the approved or allowed deviation from the SOP by placing a detailed

description of the deviation attached to the quotation or in the project file and also providing an appropriate comment on the service request when the samples are received.

For circumstances when a deviation or departure from company policies or procedures involving any non-technical function is found necessary, approval must be obtained from the Technical Director or designee.

All method modifications, regardless if they are allowed by the reference method, require validation.

13.3. Validation

The policy of ALS - STRATFORD is to apply analytical methods that have been approved, validated, and published by government agencies, professional societies, and organizations, respected private entities, and other recognized authorities. These methods have been validated for their intended use and ALS - STRATFORD uses the demonstration of competency procedures as indicated in the testing SOP to ensure the laboratory is capable.

Validation procedures describe three different classifications of validations for method modification:

1. new methods that have no existing alternate reference method (internally created)
2. permanent modifications to a published method which will be used in subsequent laboratory determinations
3. temporary modifications applied only to immediate analytical projects.

Such modified methods can only be used with written approval from the clients.

The essential quality control elements for modification and validation include:

Calibration - Performance and acceptance criteria must meet or exceed requirements specified in the reference method or SOP. The initial calibration demonstrates a concentration range where the analyte response is proportional to concentration.

Demonstration of Capability (Precision and Bias) - QC samples prepared in the specific matrix, are assessed. If possible, the recoveries are compared to method or historical control limits used for the reference method. All analytical methods and preparatory method combinations are routinely evaluated statistical control limits and reporting limits.

Sensitivity - Method Detection Limits (MDL) for methods performed at ALS - STRATFORD are determined during initial method set up and are verified or reestablished annually. The MDL will also be verified or reestablished if any significant changes are made to the analytical system. MDL procedures follow 40 CFR 136 Appendix B using the simplified EPA procedure (**32**). Limit of detection (LOD) verification and Limit of quantitation (LOQ) verification is performed on every instrument used in the analysis. The sensitivity procedures are found in the ALS-Stratford SOP *Limit of Detection and Limits of Quantitation Determination and Verification* (eQMS, GL-LODLOQ).

The Method Reporting Limit (MRL) is the lowest amount of an analyte in a sample that can be quantitatively determined with stated, acceptable precision and accuracy under stated analytical conditions (i.e. limit of quantitation- LOQ). The MRL cannot be lower than the lowest calibration standard.

Current MDLs and MRLs are available from the laboratory by request.

14. Sampling

The quality of analytical results is highly dependent upon the quality of the procedures used to collect, preserve, and store samples. ALS - STRATFORD recommends that clients follow sampling guidelines described in 40 CFR 136, 40 CFR 141, EPA SW-846, and state-specific sampling guidelines, as applicable. Sampling factors that must be taken into account to insure accurate, defensible analytical results include:

- Amount of sample taken
- Type of container used
- Type of sample preservation
- Sample storage time
- Proper custodial documentation

ALS - STRATFORD uses the sample preservation, container, and holding-time recommendations published in a the reference method for the desired testing method. The primary documents of reference are listed in Section 25 Control of Management System Documents.

ALS - STRATFORD routinely provides sample containers with appropriate preservatives for our clients. Containers are purchased precleaned and conform to the requirements for samples established by the USEPA.

Certificates of analysis for the sample containers are available to clients if requested.

Reagent water used for sampling blanks (trip blanks, etc.) and chemical preservation reagents are pretested by the laboratory to ensure that they are free of interferences and documented.

Our sample kits typically consist of:

- foam-lined, precleaned shipping coolers (cleaned inside and out, rinsed thoroughly and air-dried),
- specially prepared and labeled sample containers individually wrapped in protective material,
    - The proper preservative is typically added to the sample containers prior to shipment, unless otherwise instructed by the client.
- chain-of-custody (COC) forms,
- and custody seals.
    - Container labels and custody seals are provided for each container.

See ALS-Stratford SOP *Sample Control Procedures* (eQMS, SC-Proc) for the laboratory's Sample Acceptance Policy and more detailed instructions regarding sample receipt, log-in, storage, and disposal.

ALS - Stratford keeps client-specific shipping requirements on file and utilizes and internally managed courier system to guarantee that sample shipping requirements (same-day, overnight, etc.) are met.

ALS - Startford performs limited field sampling for drinking water samples. The detailed instructions are found in SOP Sample Collection Drinking Water (eQMS, SOP SC DW).

15. Handling of Test Items

ALS-Stratford SOP *Sample Control Procedures* (eQMS, SC-Proc) contains detailed instructions for sample handling, receipt, storage, archival, retention, and disposal.

During the login process, each sample container is given a unique laboratory code (e.g. 25B0001-01). The laboratory code is automatically assigned by Element LIMS and consists of a work order number followed by a sample number. The format is as follows:

YEAR-MONTH-SEQUENTIAL WORK ORDER NUMBER-SEQUENTIAL SAMPLE NUMBER

Where: *YEAR = Current year*
MONTH = Current month (January=A, February=B, March=C, etc.)
WORK ORDER NUMBER = sequential starting at 0001 at the beginning of each month
SAMPLE NUMBER = sequential starting at 01 for the first sample

16. Technical Records

The generation, compilation, reporting, and archiving of data is a critical component of laboratory operations. ALS - STRATFORD ensures that amendments to technical records are tracked to previous versions or to original observations. Both the original and amended data and files are retained, including the date of alteration, an indication of the altered aspects and the personnel responsible for the alterations.

Original raw data is obtained electronically, whenever possible. When manual recording of data is necessary, direct manual entry to a spreadsheet is preferable to handwritten records. When handwritten records are used, it is typically for entries to logbooks for support equipment, maintenance logs, or standard and reagent preparation logs.

Laboratory notebook entries are standardized following the guidelines in the ALS-Stratford SOP *Laboratory Notebook Control and Use* (eQMS, ADMIN-LabNote). Entries made into laboratory notebooks are reviewed and approved by the appropriate supervisor at a regular interval and annually during the internal auditing activity.

The ALS-Stratford SOP *Control and Retention of Records* (eQMS, ADMIN-Records) describes what records are maintained, how and where they are maintained, how long they are maintained, and how they are disposed. In general, all records are retained for a minimum of five years from generation of the last entry in the records. The laboratory maintains all information necessary for the historical reconstruction of data. Records stored only on electronic media are supported by the hardware and software necessary for their retrieval. For potable water records are retained for 10 years and lead and copper data in potable water are retained for 12 years.

In the event that the laboratory transfers ownership or goes out of business, laboratory records shall be retained for the contracted period and clients shall be notified prior to early destruction or disposal of samples or data. Samples may be shipped to another network location under client approval. Accrediting authorities shall be notified as soon as possible.

The control of electronic records are described in the following:

16.1. Information Management Systems

ALS - STRATFORD uses Element LIMS throughout the laboratory. Element is used to manage:

- sample information,
- sample tracking,
- sample workload projections,
- sample result storage,
- reporting,
- invoicing,
- tracking the status of a sample, and
- maintains internal chain of custody.

Access is controlled by user specific passwords. Periods of inactivity are monitored. The system will automatically log out inactive accounts.

The laboratory will notify the customer prior to changes in LIMS software or hardware configuration if the change will adversely affect customer electronic data.

The LIMS is inspected annually by the Quality Manager or designee to ensure the integrity of electronic data.

16.2. Backup and Security

ALS - STRATFORD laboratory data is acquired directly to the centralized acquisition server. All backups are performed using CommVault Simpana software to an offsite SAN in one of the ALS data centers. These disk backups are then archived to tape for long-term storage.

Incremental backups are performed daily, and a full backup is performed weekly**.** Weekly backups are stored for a month. The last of the month is stored for one year. The last backup of the year is stored for 10 years**.**

All installed software, software versions, and software changes are managed via ServiceNow (ALS service management software). The server is also locally mirrored to a hard drive to provide quick restoration of the server should the server need to be replaced.

The external e-mail system and Internet access is established via a single gateway to discourage unauthorized entry. ALS - Stratford uses a closed system for company e-mail. Files, such as electronic deliverables, are sent through the external e-mail system only via a trusted agent. The external messaging system operates through a single secure gateway. Email attachments sent in and out of the gateway are subject to a virus scan. Because the Internet is not regulated, we use a limited access approach to provide a firewall for added security. Virus screening is performed continuously on all network systems.

Refer to ALS Corporate Standard Physical Security and Asset Management (Global Policies & Forms) for additional information and requirements. The Laboratory Director is responsible for ensuring compliance to this referenced document.

17. Evaluation of Measurement Uncertainty

Refer to the ALS-Stratford SOP *Estimation of Measurement Uncertainty* (eQMS, ADMINESTUNCERT) for detailed information on how the laboratory has evaluated uncertainty and how it is determined for quantitative measurements. This SOP also provides instruction for how to determine and report the uncertainty associated with a reported result. Such information is only provided upon client request and is not included in usual reporting activities.

Estimation of measurement uncertainty is not required for qualitative measurements.

18. Ensuring the Validity of Results

Before samples are analyzed, the analytical system must be in a controlled, reproducible state from which results of known and acceptable quality can be obtained. That state is verified through the use of Quality Control (QC) procedures intended to ensure accuracy, precision, selectivity, sensitivity, freedom from interference, and freedom from contamination. The QC procedures performed at ALS - STRATFORD are defined in the testing SOPs and include:

- calibration and calibration verification;
- analysis and comparison of resultant data to predetermined control limits for method blanks, laboratory control samples, spiked matrix samples, duplicate matrix samples, and surrogates added to samples;
- analysis of performance evaluation samples;
- determination of Reporting Limits; and
- the tracking and evaluation of precision and accuracy.

The standard lab limits for these QA objectives are described below. For specific analytical methods, other QC procedures are implemented as required by the method (see method-specific SOP).

These QC procedures are performed and evaluated on a batch basis. The samples in a batch are processed together, through each step of the preparation and analysis, to ensure that all samples receive consistent and equal treatment. Consequently, results from the batch QC samples, not including field sample QC, are used to evaluate the results for all samples in the batch.

All QC parameters set by the applicable ALS - STRATFORD SOP or method reference shall not be exceeded without proper qualification and case narrative explanation in the client report.

The hierarchy of quality control requirements begins with:

- Client Requirements (if specified and documented)
- Method and/or SOP requirements
- Guidance from QAM and other general SOPs

18.1. Calibration and Calibration Verification

Instrument calibration is a QC measure taken to verify selectivity and sensitivity.

Calibration of instruments at ALS - STRATFORD is accomplished through the use of high quality reference materials (Section **10**).

In general, analytical instruments are initially calibrated with standard solutions made from the reference materials at different levels appropriate for the analysis. This is called the **initial calibration** (ICAL). The ICAL is verified with a standard solution prepared from a different lot of the reference material, preferably from a different vendor, prepared at a concentration within the ICAL. This step is called **initial calibration verification** (ICV).

At specified intervals throughout the analytical sequence, the calibration is re-verified again through the analysis of a calibration check solution, usually the mid-point standard solution. This process is called the **continuing calibration verification** (CCV). The frequency of CCV analysis is defined by the testing SOP.

If the ICAL, the ICV, or any CCV fails criteria in the analytical method, the system is recalibrated and impacted samples are reanalyzed. It is ALS - STRATFORD' policy to only report results generated under acceptable calibration conditions. Specific calibration procedures are found in the SOPs associated with each method of analysis.

Calibration blanks are analyzed at designated frequencies for some methods. These **calibration blanks** (CCBs) are solutions of either analyte-free water, reagent, or solvent that are analyzed in order to verify the analytical system is contamination-free. The frequency of CCB analysis is specified in the testing SOPs. Additional project-specific requirements may also apply to CCBs.

Alternative calibration sequences or procedures will be discussed with clients.

18.2. Analysis of Method Blanks

The **method blank** (MB) is an analyte-free matrix (water, soil, etc.) subjected to the entire preparation and analytical process. When analyte-free soil is not available, organic-free sand (called Ottawa sand), glass beads, Teflon chips or an acceptable substitute is used. The method blank is analyzed to demonstrate that the analytical system itself does not introduce contamination. The method blank results should be below the **Method Reporting Limit** (MRL). Unless otherwise specified in the method, general guidelines for qualifying sample results with regard to method blank quality are as follows:

- If method blank is <MDL and sample results are >MRL, then no qualification is required.
- If method blank is >1/2 MRL but <MRL and sample results are >MRL, then qualify results to indicate that analyte was detected in the reagent blank.
- If method blank is >MRL, then further corrective action and qualification is required.

A method blank is included with the analysis of every sample preparation batch, every 20 samples, or as stated in the method, whichever is more frequent.

18.3. Analysis of Laboratory Control Samples

The **laboratory control sample** (LCS) is an aliquot of analyte-free water or analyte-free solid (Ottawa sand) to which known amounts of the method analyte(s) is (are) added. A reference material of known matrix type, containing certified amounts of target analytes, may also be used as an LCS. An LCS is prepared and analyzed at a minimum frequency of one LCS per 20 samples, with every analytical batch or as stated in the method, whichever is more frequent. The LCS sample is prepared and analyzed in exactly the same manner as the field samples.

The percent recovery of the target analytes in the LCS is compared to established control limits and assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit. Comparison of batch-to-batch LCS analyses enables the laboratory to evaluate batch-to-batch precision and accuracy.

The results of the LCS are reported as **percent recovery**:

$$\%\ Recovery\ =\ \frac{X}{K}\ x\ 100$$

Where: X = Measured value and K = Expected value

18.4. Analysis of Spiked Matrix Samples

Matrix QC samples are generally used to determine acceptability of methods chosen on a field sample and are therefore not used to determine batch acceptability. If the analysis of **matrix spike** (MS) is not possible, a duplicate LCS or QC should be analyzed in the batch.

Matrix spiked samples are aliquots of samples to which a known amount of the target analyte (or analytes) is (are) added. The samples are then prepared and analyzed in the same analytical batch, and in exactly the same manner as are routine samples. For the appropriate methods, matrix spiked samples are prepared and analyzed and at a minimum frequency of one spiked sample (and one duplicate spiked sample, if appropriate) per twenty samples. The spike recovery measures the effects of interferences caused by the sample matrix and reflects the accuracy of the method for the particular matrix in question. The results are reported as **percent recovery**.

$$\%\ Recovery\ =\ \frac{(Xs\ -\ Xu)}{K}\ x\ 100$$

Where Xs = Measured value in the spiked sample, Xu = Measured value in the unspiked sample, and K= Expected value

Laboratory criteria will be used in the absence of client-specified criteria. Failure to meet these criteria will be noted in the report.

18.5. Analysis of Duplicate Matrix Samples

Matrix QC samples are generally used to determine acceptability of methods chosen on a field sample and are therefore not used to determine batch acceptability. If the analysis of matrix spike is not possible, a duplicate LCS or QC should be analyzed in the batch.

A **duplicate matrix spike** sample or **duplicate matrix sample** is used to monitor the precision (repeatability) of the method chosen on a field sample. If a sufficient amount of the analyte(s) of interest is present in the field sample, a matrix duplicate sample is analyzed directly. If the analyte(s) of interest are not present in a sufficient amount, two additional portions of field sample are spiked with the analyte(s) of interest to ensure that meaningful results are obtained. A pair of duplicate samples (matrix/matrix duplicate or matrix spike/matrix spike duplicate) is analyzed with every analytical batch of environmental samples. The results of the analysis of duplicate samples are reported as **relative percent difference** (RPD).

$$RPD\ =\ \frac{|X_1\ -\ X_2|}{\left[\frac{(X_1\ +\ X_2)}{2}\right]}\ x\ 100$$

Where: $|X_1 - X_2|$ = The absolute value of the difference between the two sample values, $[(X_1 + X_2)/2]$= The average of the two sample values

Laboratory criteria will be used in the absence of client-specified criteria. Failure to meet these criteria will be noted in the report.

18.6. Analysis of Surrogates Added to Samples

Surrogates are organic compounds which are similar in chemical composition and chromatographic behavior to the analytes of interest, but which are not normally found in environmental samples. Depending on the analytical method, one or more of these compounds is added to method blanks, calibration and check standards, and samples (including duplicates, matrix spike samples, duplicate matrix spike samples and laboratory control samples) prior to extraction and analysis in order to monitor the method performance on each sample. **Surrogate recovery** is a measure of the accuracy and selectivity of the method in the sample matrix. Surrogate results are reported as percent recovery.

$$\%\ Recovery\ =\ \frac{X}{K}\ x\ 100$$

Where: X = Measured value and K = Expected value

18.7. Analysis of Internal Standards

Internal standards (IS) are known amounts of specific compounds that are added to each sample prior to instrument analysis. Internal standards are generally used for GC/MS and ICP-MS procedures to correct sample results that have been affected by changes in instrument conditions or changes caused by matrix effects. The requirements for evaluation of internal standards are specified in each testing SOP.

18.8. Analysis of Interference Check Samples

An **interference check sample** (ICS) is a solution containing both interfering and analyte elements of known concentration that can be analyzed to verify background and interelement correction factors in metals analyses. The ICS is prepared to contain known concentrations (method or program specific) of elements that will provide an adequate test of the correction factors. The ICS is analyzed at the beginning and end of an analytical run or at a method-specified frequency. Results must meet method criteria (defined in the testing SOPs) and any project-specific criteria.

18.9. Analysis of Post Digestion Spikes

Post digestion spikes are samples prepared for metals analyses that have an analyte spike added to determine if matrix effects may be a factor in the results. The spike addition should produce a method-specified minimum concentration above the method reporting limit. A post digestion spike is analyzed with each batch of samples and recovery criteria are specified for each method.

18.10. Analysis of MRL Standards (CRDL, LFB)

A **laboratory blank fortified** (LFB) at the method reporting limit (MRL) is used to verify the minimum reporting limit. The LFB is carried through the entire extraction and analytical procedure. An LFB is required with every batch of drinking water samples.

18.11. Marginal Exceedances

When the acceptance criteria for a positive control are exceeded high (i.e., **high bias**) and there are associated samples that are non-detects, then those non-detects may be reported with data qualifying codes, since it is unlikely there is any of the analyte of interest in the impacted samples.

The laboratory does not employ acceptance of positive controls that are exceeded low if they exceed a maximum regulatory limit, since the laboratory is rarely informed of the purpose nor limits of the testing.

The laboratory does not employ acceptance of the LCS if a small number of analytes fail in a large list of analytes. The laboratory reprepares and re-analyses samples when any target analytes fail in the LCS.

18.12. Determination of Method Detection Limits (MDLs) and Reporting Limits

See EPA 2016 MDL procedure and ALS-Stratford SOP *Limit of Detection and Limit of Quantitation Determination and Verification* (eQMS, GL LODLOQ) for detailed instructions for how initial and ongoing MDLs and reporting limits are determined.

18.13. Analysis of Performance Evaluation Samples (PT)

Proficiency testing (PT) samples are prepared by an independent organization outside the laboratory, called PT Providers.

PT providers are evaluated as per the requirements for External Suppliers (Section **11.2**). For client work that is covered under TNI accreditation, and the analytes of interest are listed on the TNI maintained FoPT tables, the PT Provider must be a TNI recognized organization. It is recommended that these same PT providers be used for non-TNI related PT testing, but if unavailable, at a minimum, PT Providers must have ISO/IEC 17043 accreditation, and the testing requested must fall under the PT providers scope of accreditation. When this is not possible PT Providers are evaluated based on their accreditations (ISO/IEC 17025 and ISO/IEC 17034 are valid alternatives).

PT samples are received directly from the PT provider and analyzed at regular intervals to monitor laboratory accuracy. PT samples are introduced into the regular sample stream of the laboratory and analyzed as routine samples by analysts who regularly perform the method. Laboratory personnel follow all instructions provided by the PT provider.

The laboratory sections submit results to the QA Manager for subsequent reporting to the appropriate agencies or study provider by the indicated reporting deadline. Information for PT rounds is captured on the ALS-Stratford CERTS_PT Results_STRATFORD hosted on the US Environmental SharePoint site.

Results of the performance evaluation samples and audits are reviewed by the QA Manager or designee and entered into the CERTS_PT_Results_STRATFORD spreadsheet for historic performance tracking. Any results outside that are identified as outside acceptance criteria, the control of nonconforming work is initiated and corrective action is taken.

When there is a repeat failure (either F/F/P, F/P/F, F/F/F, or P/F/F pattern for the last 3 rounds) testing for the impacted analyte and/or method is internally suspended as per the procedures defined in ALS memo *Actions PT Double Failure* (eQMS, CORP – Actions PT Double Failure).

ALS - STRATFORD routinely participates in the following studies:

- Water Pollution (WP) and additional water parameters, 2 per year.

- Water Supply (WS) PT studies, 2 per year.
- Hazardous Waste/Soil PT studies, 2 per year.
- AIHA ELPAT for lead in dust and paint and lead in wipes analysis, 4 per year
- Other studies as required for specific certifications, accreditations, or validations.

The following guidelines are followed by ALS - Stratford:

- Averaging results is prohibited.
- Only qualified ALS - Stratford laboratory employees analyze PT samples.
- Results are not discussed with outside entities or other ALS laboratories prior to the deadline for receipt of the results.
- ALS does not subcontract to other laboratories or receive from other laboratories any PT samples.

The Laboratory Director, Technical Managers or the Quality Manager can institute the analysis of additional PT samples or modify the performance evaluation program as appropriate.

18.14. Data Review of Batch

The integrity of the data generated is assessed through the evaluation of the sample results, initial calibrations, and QC samples. The criteria for evaluation of QC samples are listed within each testing SOP. Review of data is accomplished at three levels: Analyst, Group Leader and Lab Management.

- **Analyst QC Review and Evaluation**: The analyst has full responsibility for data entry into the LIMS system. All hand written data are entered manually into the system and immediately given a second review for accuracy for transcription and calculation. All instrumental data is automatically uploaded using the **Data Tool Module** of Element LIMS. Strict adherence to the analysis-specific SOP in terms of QC acceptance criteria is requried before entry of any data into the LIMS system. The analyst also will review the data from a logic perspective. For example, if one sample is an influent and the other an effluent, the data should be reflective of this (i.e. the Influent should be higher than the effluent). If the data is illogical, this fact is brought to the attention of the supervisor for resolution.
    - **The primary testing Analyst is directly responsible for ensuring the data reported in Element reflects original observation and is associated with passing QC**. Any data not associated with passing QC or of questionable data integrity must be discussed with the Analyst Supervisor or Technical Director prior to upload to Element. If reported, it is this Analyst that must ensure the data is correctly qualified.
- **Department Leader QC Review and Evaluation**: The Department Leader or designee performs a secondary review, and if the data is found to be acceptable approves the data in LIMS.
- **Management QC Review and Evaluation**: The Managing Director or his designee reviews every laboratory report with respect to completeness and data logic.
    - In addition, random projects are selected for full review of raw data associated with the project to ensure adherence to SOPs and project QA objectives, where known. The review encompasses examination of transcription errors from log-in and analysis, chain-of-custody, raw data for VOA, SVOC, etc. and limited QC data review including holding times, surrogate recoveries and linear ranges. This full review is conducted by the Quality Assurance Officer and usually coincides with internal auditing activities.
- **Holding Times** – Holding times assigned as follows:
    - by hours = tracked from the minute of sampling to the minute of analysis
    - by days = tracked by the day, holding time ends at midnight of the last day
    - longer units (weeks, months, years) are handled in the same manner as a holding time defined in days, after converting the holding time to days.
        - Weeks are defined as 7 days;
        - months are defined as 30 days;
    - years are defined as 365 days.

When a time of sampling is not provided by the client, ALS - STRATFORD uses the first minute of the sampling day (00:00) in the calculation of holding time. Examples:

48 hour holding time: Sampled May 1 09:32. Holding time is exceeded if not analyzed by May 3 09:32.

5 day holding time: Sampled May 1 09:32. Holding time is exceeded if not analyzed by May 6 at 23:59.

6 month holding time: Sampled May 1 09:32. Holding time is exceeded if not analyzed by Oct 28 23:59.

- **Sample Results (Inorganic)** – Following sample analysis and calculations (including any dilutions made due to the sample matrix) the result is verified to fall within the calibration range. If the result is above the calibration range, the sample is diluted and analyzed to bring the result into calibration range. When sample and sample duplicates are analyzed for precision, the calculated RPD is compared to the specified limits. The sample and duplicate are reanalyzed if the criteria are exceeded. The samples may require re-preparation and reanalysis.
- **Sample Results (Organic)** – For GC/MS analyses, it is verified that the analysis was within the prescribed tune window. If not, the sample is reanalyzed. Following sample analysis and calculations (including any dilutions made due to the sample matrix) peak integrations, retention times, and spectra are evaluated to confirm qualitative identification. Internal standard responses and surrogate recoveries are evaluated against specified criteria. If internal standard response does not meet criteria, the sample is diluted and reanalyzed. Results outside of the calibration range are diluted to within the calibration range. For GC and HPLC tests, results from confirmation analysis are evaluated to confirm positive results and to determine the reported value. The procedure to determine which result to report is described in the SOP for the applicable method. If obvious matrix interferences are present, additional cleanup of the sample using appropriate procedures may be necessary and the sample is reanalyzed. When dilutions are performed, the MRL is elevated accordingly and qualified.

18.15. Tracking, Trending, and Evaluation of Long-Term Accuracy and Precision

In addition to evaluating individual batch QC results against control limits, QC results from successive batches are also evaluated for possible trends. While a trend is not necessarily an out-of-control situation in itself, it can provide an early warning of a condition that can cause the system to go out of control.

ALS - STRATFORD analytical staff identify trends in analytical systems through the routine evaluation of data. The QA Manager or designee produces control charts as requested to assess trends. The occurrence of a trend does not invalidate data that are otherwise in control. If a trend is observed, the preventive action procedure is initiated.

The generation of control charts is routinely performed at ALS - Stratford. Surrogate and LCS recoveries are monitored and charted using in-house software to produce **control charts** (results vs time). Control charts are used to monitor the data and to identify various trends in the analytical results. Evaluation of long-term trends is performed annually for all LCS and surrogates using average and standard deviation, and typically coincides with internal auditing activities. The QA Manager or designee compares the newly generated statistical limits to the old and determines whether the new acceptance criteria is to replace the previous criteria. Investigative action may be taken if charts reveal a potential problem with data quality through the preventive action procedure.

19. Reporting of Results

When all of the data in the LIMS has been approved by the analytical departments, the system indicates that report is ready for generation. A report writer generates the applicable report from the LIMS and assembles the package based upon the package level.

The instructions for generation of a report and package assembly are given in the ALS-Stratford SOP *Generating EDDs and Reports for All Clients and Data Port Web Portal* (eQMS, ADMIN-EDDRptCC).

19.1. Report Requirements

The report identifies the method used. If the method is modified, it is noted as “modified” in the report.

Any abnormal sample conditions, deviation from hold time, irregularities in preservation or other situations that might affect the analytical results are noted in the report and associated with the analytical results.

The contents of the report include:

- The report title with a unique report number
- the name, address, and telephone number of the laboratory
- The name and address of the client or project
- Sample description and associated unique laboratory identification numbers
- The dates of sample collection, sample receipt, sample preparation, and analysis
- The time of sample preparation and/or analysis if the required hold time for either activity is 48 hours or less
- A method identifier for each method, including methods for preparation steps
- The MDL or minimum reporting limit for the analytical results
- The analytical results with units and qualifiers as required

- A description of any quality control failures and deviations from the accepted method
- The name and title of the individual(s) who accepts responsibility for the content of the report.
- The date the report is issued
- Clear identification of any results generated by a subcontract laboratory
- If sampling activities are performed by ALS - Stratford personnel, a reference to the sampling procedures.
- Page numbers and total number of pages

Prior to release of the report to the client, the PM reviews the entire report for completeness. The PM ensures that any and all client-specified objectives were successfully achieved. All data are reported in units consistent with project specifications to enable easy comparison of data from report to report.

For subcontracted analyses, the PM verifies that the report received from the subcontractor is complete. This includes checking that the correct analyses were performed, the analyses were performed for each sample as requested, a report is provided for each analysis, and the report is signed. The PM accepts the report if all verification items are complete. Acceptance is demonstrated by forwarding the report to the client.

ALS - Stratford provides results objectively and does not interpret results or state opinions.

ALS - Stratford does not perform calibration services.

The laboratory reports results based on the sample provided by the customer.

19.2. Qualifiers

Qualifiers used by the laboratory are retained within the LIMS and are included with all client reports as an abbreviation with description in a summary table that is included with all client reports. Only the qualifiers used are included. They can be exported from LIMS upon request and are maintained by the LIMS Administrator.

19.3. Amended Reports

Amended reports of analytical results are issued to correct errors that are identified either by clients or internally. Amendments to analytical reports will only be made in supplemental documents that are clearly identified as amended.

Amended Reports are stored with the original report, are uniquely identified, and make reference to original reports. All amended reports must meet the same requirements as the original report. A peer review process is used to ensure amended results are accurate.

Periodically the QA Manager reviews the frequency and reason for amended report. If there is evidence of a chronic trend either with higher than usual frequency in general or for a specific type of error, then the control of nonconforming work is initiated.

Amended reports require the following items:

- the date amended,
- commentary in the case narrative identifying that this is an amended report and reason for the amendment, and
- qualifier or other means of clearly identifying changed results.

19.4. Deliverables

In order to meet individual project needs, ALS – Stratford provides several levels of analytical reports. Standard specifications for each level of deliverable are described below[20]. Variations may be provided based on client or project specifications.

When requested, ALS - Stratford provides **Electronic Data Deliverables** (EDDs) in the format specified by client need or project specification. ALS - Stratford is capable of generating EDDs with many different formats and specifications. Refer to the ALS-Stratford SOP *Generating EDDs and Reports for All Clients and Data Por Web Portal* (eQMS, ADMINEDDRptCC) for additional instructions.

Level	Specifications
Tier I	cover letter
	Sample analytical Results
	Sample Hold Time Summary
Tier II	Transmittal letter
	Case Narrative
	Sample Detection Summary

[20] The order of items may vary in actual client reports.

Level	Specifications
	Sample Cross Reference
	Chain of custody documents and sample/cooler receipt documentation
	Report Qualifiers and Definitions, Acronyms, Accreditation IDs, Analyst Summary
	Sample analytical results
	Method blank results
	Surrogate recovery results and acceptance criteria for applicable organic methods
	Matrix spike result(s) with calculated recovery and including associated acceptance criteria
	Duplicate or duplicate matrix spike result(s) (as appropriate to method), with calculated relative percent difference
	Laboratory Control Sample result(s) with calculated recovery and including associated acceptance criteria
	Dates of sample preparation and analysis for all samples and QC
	Sample Hold Time Summary
Tier III **Tier IV**	Tier III varies from Tier IV in that slightly less information is provided but include essentially the same information.
	Tier I, and II specifications
	All raw data including preparation and analysis bench sheets and instrument printouts, all applicable chromatograms, spectral, confirmation, and manual integration raw data (for organics analyses this includes GC/MS tuning results, mass spectra of all positive hits, and the results and spectra of TIC compounds when requested), QC data, calibration data (initial, verification, continuing, etc), calibration blanks or instrument blanks (as appropriate to method).

20. Complaints

ALS - Stratford has a documented process for how complaints are received, recorded, and evaluated (see SOP *Handling Client Complaints*, eQMS ADMINComplaints). This documentation is available upon request.

21. Nonconforming Work

When sample results do not conform to established quality control procedures, responsible management will evaluate the significance of the nonconforming work and address the nonconformance according to the procedures in the ALS-Stratford SOP *Control of Nonconforming Work* (eQMS, ADMINControlNCWork).

Most non-conformances are random events and can be addressed on the analytical report with standard qualifiers and statements prior to the release of the report. If a QC measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s).

When a nonconformance or other quality issue occurs that casts doubt on the validity of reported test results or additional client instructions are needed, the PM notifies the client within 10 business days of the discovery[21].

22. Control of Data and Information Management

Refer to Section 16 for additional information on retention of electronic records.

The laboratory has access to all data and information through the internet, intranet, network locations and hard copy.

Refer to the ALS Corporate policy *Data and IT Usage Policy* and *Information Management Policy* (Global Policies & Forms) for information on how ALS manages, secures, and controls data.

A continuing effort is made at ALS - Stratford to increase the use of automated data handling, improve efficiency, and minimize human error, through uploads of information to LIMS.

All raw data or original observations are retained. Handwritten data is verified for transcription errors by the secondary reviewer.

Software errors are treated as a nonconformances. If these occur for analytical instruments, the event and resolution is recorded in the applicable maintenance log. If it occurred for general laboratory systems, then the event is recorded through the control of nonconforming work process.

[21] In certain cases where there is a risk of legal response, a longer time period may be required to ensure that the proper authorities are notified prior to alerting the impacted clients. In such instances the ALS Legal team is consulted prior to taking any actions with clients and notification is at the discretion of ALS Legal.

Access to ALS intranet and servers are controlled through passwords and windows security. ALS passwords change every 90 days. User roles are assigned and restrict access to certain functions within the ALS intranet.

Access to LIMS is controlled through usernames and passwords. LIMS passwords are changed at a minimum of once per year. Computer security awareness training is provided upon hiring and on an annual basis. Records of the training are maintained. Inspections of the LIMS is performed at least annually by the QA Manager or designee to ensure integrity of electronic data, as part of internal auditing activities

23. Management System Requirements

The laboratory has implemented **Option A** from the ISO/IEC 17025:2017 standard as a management system, meaning that ALS-Stratford does not maintain ISO 9001 certification. The following sections address the required elements of Option A, as defined by ISO/IEC 17025:2017.

24. Management System Documentation

This manual describes or references the policies and objectives of the ALS - Stratford management system. The laboratory SOPs hosted on eQMS Document Register describe the details on how objectives are accomplished. Additional minimal expectations are defined in ALS Corporate policies and procedures maintained on the Global Policies & Forms SharePoint library.

Evidence of commitment is the review of this manual annually and the records of reading by all employees. Additionally, employees are assigned pertinent procedures as needed to ensure objectivity and consistency.

The policies are supported in this management system with references to the procedures as appropriate.

All employees have access to the Quality Assurance Manual and the supporting procedures, documents, and forms.

25. Control of Management System Documents

Procedures for control and maintenance of documents are described in ALS - Stratford SOP *Document Control* (eQMS, ADMINDOC).

External documents, such as reference methods, accreditation policies and requirements, and reference manuals are maintained under document control through the eQMS external document library.

SOPs that are no longer in use are archived. The eQMS system ensures that Users have access to only Current documents. Access to other status documents is restricted to specific role types.

Paper logbooks are scanned and retained on the ALS-Stratford server.

Historical versions of the SOPs hosted on eQMS are retained on the ALS-Stratford server.

26. Control of Records

Refer to Section **16** for additional information.

All records are stored in accordance with ALS-Stratford SOP *Control and Retention of Records* (eQMS, ADMINRECORDS).

Logbook entries are standardized following the ALS-Stratford SOP *Laboratory Notebook Control and Use* (eQMS, ADMIN LabNote).

ALS - Stratford personnel are responsible for retention, retrieval, and disposition of final records of laboratory data and activities. This includes[22]:

- sample receipt including original COC forms and any related receipt checklist,
- data packages,
- laboratory notebooks,
- instrument maintenance logs,
- training records,
- internal audits and external assessment records,
- management reviews,
- PT reports,

[22] Some of these records are maintained by ALS Support functions including HR, Financial, IT, and Procurement.

- QC charts,
- MDL/LOQ calculations,
- accreditation certificates and associated scope of accreditations, including notice of change letters and other critical communication with Accreditation Bodies,
- subcontractor accreditations[23],
- controlled documents including withdrawn and superseded versions,
- metrology data including any records associated with metrological traceability,
- data investigations,
- client complaints and queries,
- non-conformances,
- corrective and preventive actions,
- vendor approvals,
- purchasing documents,
- receipt records,
- and certificates of analysis, including calibration certificates and certificates of compliance or authenticity.

Changes made to data, including electronic data, must clearly identify the date and the person making the change.

All records are available to the accreditation bodies. Whenever possible, electronic instrument records are stored on the ALS-Stratford network, which is backed up remotely to prevent data loss due to hardware failure (refer to Section **16.2**).

Software and computers or instruments capable of using it is retained for as long as the original data needing that version is retained by the Laboratory Director.

27. Actions to Address Risks and Opportunities

Refer to previous sections as appropriate for detailed instructions on the processes mentioned in this section.

Multiple Quality System tools are used with the goal of identifying trends and preventing non-conformance with pro-active systems. These tools include the use of:

- preventive maintenance (defined in the routine maintenance requirements of testing SOPs),
- data review procedures, purchasing from approved vendors,
- second source standards and batch QC,
- interlaboratory comparison through participation in the Proficiency Testing programs,
- QC Charting for precision and bias evaluation,
- customer feedback as collected through the annual survey and through regular communication between the PMs and clients,
- internal auditing,
- management review,
- electronic data backup and computer security procedures,
- initial, ongoing, and refresher training procedures,
- monthly risk reporting through various required management reports for internal and regional review,
- document control including annual SOP review, which controls instructions provided to Employees, and
- initial and annual ethics training,

When systematic non-conformances are identified in one area, prevalence review is conducted to determine if implementation in other lab areas and other ALS labs is needed.

All bench level personnel are responsible to continually detect short-term trends in QC data and respond appropriately (instrument maintenance, check of extraction or instrument conditions, check of standards, etc.). Long Term trends are identified with QC Charting, review of Holding Time exceedances, and review of recurring non-conformances by the QA Manager or designee.

ALS - Stratford views risk management as a key component of its corporate governance responsibilities and an essential process in achieving and mandating a viable organization. ALS - Stratford is committed to enterprise wide risk management to ensure its corporate governance responsibilities are met and its strategic goals are realized.

Refer to ALS Corporate documents Risk Management Policy and Risk Appetite and Tolerance Policy (Global Policies & Forms) for details.

Risks to our business and how we address them include:

[23] ALS network laboratories have accreditations maintained on ALS Solutions and the ALS Group Sustainability site.

- **Impartiality by Employees**

  Analytical testing is completed without undue pressure to modify results to meet client objectives. ALS does not view this as a risk. There are many firewalls in the lab process to prevent occurrence.
  PMs are in contact with clients but there is no ability to influence testing results
  A data generated must be peer reviewed by a second party
  Lab operations only see samples, sample names and numbers. They do not have direct contact with clients.
  Annual Ethics and Data Integrity Training for all employees
  ALS Code of Conduct, ALS Whistleblower Policy, ALS Integrity Hotline, and Integrity and Compliance Helpline.

- **Chemical Exposure**

  Failure to practice procedures as trained, issues with the facility, and poor engineering controls can result in injury to employees, lost time, med/hospital situation, contamination, and can close the site.
  ALS has policies, chemical exposure training, and readily available SDS sheets. Employees are expected to offer suggestions for improvement and formally report any conditions where concern for safety is recognized.

- **Explosion/Chemical Fire**

  Improper chemical storage and usage along with lack of equipment and facility upkeep can result in loss of life, loss of property, and laboratory down time.
  ALS performs inspections and training, keeps an inventory of chemicals, establishes storage locations, and maintains minimal quantities of chemicals.

- **Supply Disruption**

  Natural disaster and vendors unable to provide needed supplies can disrupt the business, increase expenses, and result in lost production and lost clients.
  ALS maintains multiple sources for supplies, develops relationships with our vendors, and emphasizes communication between analysts, managers, purchasing and vendors.

- **Loss of Key Employees**

  Resignation, leave for personal reasons or for other employment can negatively impact the business. Communication, cross-training, designated backups, and having a pool of potential replacements minimizes this risk. We provide a positive atmosphere for employees and provide small perks to reward dedication.

- **Computer and Instrument Issues**

  Computer, instrument, or other IT failures can result in loss of revenue, loss of service, and loss of data.
  ALS provides necessary IT resources for instruments and computers including replacing older computers, keeping related systems in good repair, and replacing when necessary. ALS continues to build robust data systems and make provisions for stellar back-up storage for all data.

- **Reputation**

  Falsifying test results can result in loss of credibility, loss of clients, loss of revenue, and loss of accreditation.
  All new employees must sign an ethics agreement and have initial ethics and data integrity training. Annually, all employees must take ethics and data integrity refresher training. All data undergoes a proper peer review. ALS maintains a strong quality system.

- **Legal Ramifications**

  Not following workplace and environmental laws and failure to practice procedures as trained can result in license revocation, fines, and disruption of the business.
  Targeted and ongoing training, inspections, and having established procedures minimizes this risk. ALS continues to follow all laws and regulations.

- **Loss Time Injury**

  Failure to practice procedures as trained and not having proper safeguards in place can result in injury to employees, lost time, med/hospital situation, contamination, and can close the site.
  Policies, specific task related training, targeted and ongoing training, inspections, workplace safeguards, cross training, and designated backups, minimize this risk. ALS continues to grow the safety program and culture.

- **Loss of Revenue**

  Can be caused by various audit fines and contract penalties for late data resulting in loss of revenue and disruption in business.

Policies, specific quality training, targeted and ongoing training, inspections, workplace safeguards, and internal audits minimize these risks.

28. Improvement

ALS management is committed to continually improving the effectiveness of the management and quality systems by implementing the requirements of this quality manual. ALS is committed to improvements of the management systems through compliance with its own policies and procedures, including the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

ALS surveys clients and gains feedback on services provided. This input to management is managed at a corporate level and is reviewed during the management review processes. Customer feedback provides important information to allow the company to continually improve. The laboratory maintains and documents timely communication with the client for the purposes of seeking feedback and clarifying customer requests. Feedback is used and analyzed to improve the quality of services.

29. Corrective Actions

ALS Laboratory operations are governed by documented procedures, requirements, quality assurance plans, project plans, and contracts. When any operation, for any reason, does not conform to the requirements of the governing documents, the aberrant event, item, or situation must be properly documented and evaluated. If the evaluation indicates a systematic problem, root cause evaluation is undertaken, and corrective action is initiated.

Procedures for the documentation and resolution of corrective action are detailed in the ALS-Stratford SOP *Control of Nonconforming Work* (eQMS, ADMINContorlNCWork).

30. Internal Audits and External Assessments

Internal audits are conducted in accordance with ALS-Stratfod SOP *Internal Audit of Laboratory Testing Activities* (eQMS, ADMIN LAB Audit) and *Internal Quality Audit* (eQMS, ADMIN IntAudit).

When internal and external audits or data assessments reveal a cause for concern with the quality of the data an investigation is initiated by quality assurance personnel to determine the extent of the problem.

Internal audits include examination of laboratory practice, the use of data handling systems, documentation and document control, personnel qualification and training records, procurement activities, and other systems that support and augment the laboratory analytical function.

Audit and external assessment findings and any event that casts doubt on the validity of the testing results requires client notification within 15 business days of the discovery of the issue and proposed corrective actions to resolve nonconformance submitted to the customer within 30 business days of the discovery[24].

31. Management Review

ALS-Stratford has regular operations, technical, quality, and other support function meetings to review performance and ensure strategic goals are met. Regional ALS require regular monthly updates and quarterly strategic updates on ALS-Stratford performance in meeting objectives defined in the ALS Balance Scorecards and annual strategic plan. There are also other monthly performance reports required for safety, quality, and technology. This continuous monitoring helps to mitigate risks and opportunities.

It is the responsibility of the Laboratory Director to annually review the success of ALS-Stratford in meeting its objectives and compliance to the requirements of this management system. Trending the monthly and quarterly reports is used in the annual review including other inputs such as:

a. Changes in internal and external issues that are relevant to the laboratory; including risks to the laboratory's impartiality and any plan to minimize risks
b. Fulfilment of objectives;
c. Suitability of policies and procedures;

[24] In certain cases where there is a risk of legal response, a longer time period may be required to ensure that the proper authorities are notified prior to alerting the impacted clients. In such instances the ALS Legal team is consulted prior to taking any actions with clients and notification is at the discretion of ALS Legal.

d. Status of actions from previous management reviews;
e. Outcome of recent internal audits;
f. Corrective actions; Preventive Actions
g. Assessments by external bodies;
h. Changes in the volume and type of the work or in the range of laboratory activities;
i. Customer and personnel feedback;
j. Complaints;
k. Effectiveness of any implemented improvements;
l. Adequacy of resources;
m. Results of risk and opportunity identification;
n. Outcome of the assurance of the validity of results (interlaboratory comparisons or proficiency tests);
o. Other relevant factors, such as monitoring activities, quality control activities, and training.
p. Reports from managerial and supervisory personnel
q. Certifications, Accreditations, Licenses, Permits
r. Recommendations for improvement
s. Facility Control

Inputs may be gathered by roles as designated by the Laboratory Director and may include regional role involvement.

The outputs from the management review shall record all decisions and actions related to at least:

a. The effectiveness of the management system and its processes;
b. Improvement of the laboratory activities related to the fulfilment of the requirements of this document;
c. Provision of required resources;
d. Any need for change.

A summary of these outputs is generated annually and retained for year to year tracking of performance. Items that have a decreasing performance trend are flagged for more aggressive corrective action and those that are improving are reviewed to identify "what worked" to share that information within the ALS network or for future reference.

32. References

In addition to the normative references indicated in Section **2**, the following external references were used in this document:

- *Mechanical Volumetric Dispensing Devices, Volumetric Labware, and Non-Volumetric Labware,* hosted on eQMS under Site Rochester and Legacy ID RS-ADM-PCAL.
- *Definition and Procedure for the Determination of the Method Detection Limit, rv 2, EPA, Dec 2016*
- *Good Automated Laboratory Practices, Principles and Guidance to Regulations For Ensuring Data Integrity In Automated Laboratory Operations*, EPA 2185 (August 1995).
- *Manual for the Certification of Laboratories Analyzing Drinking Water*, 5th Edition, EPA 815-R-05- 004 (2005).
- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, (September 1986)
  - and Updates I (July 1992), II (September 1994), IIA (August 1993), IIB (January 1995), III (December 1996), Final Update IV (February 2007), Final Update V (August 2015)
  - and updates posted online at http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm. See Chapters 1, 2, 3, and 4.
- *Methods for Chemical Analysis of Water and Wastes,* EPA-600/4-79-020, (Revised March 1983).
- *Methods for the Determination of Inorganic Substances in Environmental Samples,* EPA/600/R-93/100 (August 1993).
- *Methods for the Determination of Metals in Environmental Samples,* EPA/600/4-91/010 (June 1991) and Supplements.
- *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater,* EPA 600/4-82-057 (July 1982) and 40 CFR Part 136, Appendix A.
- *Methods for the Determination of Organic Compounds in Drinking Water*, EPA/600/4-88/039 (December 1988) and Supplements.
- *Standard Methods for the Examination of Water and Wastewater,* on-line Edition (various years).
- *40 CFR Part 141, National Primary Drinking Water Regulations.*
- Annual Book of ASTM Standards, Part 31, *Water.*

- *U. S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review,* EPA-540/R-94/012 (February 1993).
- *U. S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review,* EPA-540/R-94/013 (February 1994)

APPENDIX A – ABBREVIATIONS, TERMS, DEFINITIONS AND UNITS

Acronym / Term	Definition
ACS	American Chemical Society
ALS	Australia Laboratory Services
ANSI/ASQC	American National Standards Institute / American Society for Quality Control
ASTM	American Society for Testing and Materials
BFB	4-Bromofluorobenzene
BNA	Base Neutral Acid organic compounds (aka SOC or SVOCs)
BOD	Biological Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAS	Chemical Abstract Service Registry Number
CCV	Continuing Calibration Verification
CCB	Continuing Calibration Blank
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program (through EPA)
CoC	Chain of Custody
COD	Chemical Oxygen Demand
CFR	Code of Federal Regulations
CT	Connecticut
CV	Coefficient of Variation
DCM	Dichloromethane (also Methylene Chloride)
DEC	Department of Environmental Conservation
DEP	Department of Environmental Protection
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DO	Dissolved Oxygen
DOC (or ODOC)	Demonstration of Capability / Ongoing Demonstration of Capability
DoD/DOE	Department of Defense / Department of Energy
DOH	Department of Health
DQO	Data Quality Objective
DW (or PW)	Drinking Water / Potable Water
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
EPCRA	Emergency Planning & Community Right-to-Know Act
eQMS	electronic Quality Management System
ERA	Environmental Resource Associates
FDA	Food & Drug Administration
FIA	Flow Injection Analysis
FID	Flame Ionization Detector
FIFRA	Federal Insecticide, Fungicide & Rodenticide Act
FR	Federal Register
GC	Gas Chromatography
GC/MS	Gas Chromatography / Mass Spectrometry
HECD / ELCE	Hall Electrolytic Conductivity Detector
HR	Human Resources
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICP-AES	Inductively Coupled Plasma Atomic Emission Spectrometry (aka ICPAES)
ICP/MS (or ICP-MS)	Inductively Coupled Plasma / Mass Spectrometer (aka ICPMS)
ICV	Initial Calibration Verification
ID	Identifier
IDOC	Initial Demonstration of Capability
IR	Infrared Spectrophotometer
ISE	Ion Selective Electrode
ISO/IEC	Internal Organization for Standardization / International Electrotechnical Commission

Acronym / Term	Definition
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
LOR	Limit of Reporting
M (or MOD)	Modified (or MOD)
MB	Method Blank
MCL	Maximum Contaminant The highset permissible concentration of a substance allowed in drinking water as established by the EPA.
MDL	Method Detection Limit
ME	Marginal Exceedance
MPN	Most Probably Number
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not applicable or North America depending on context
NAS	National Academy of Sciences
NCASI	National Council for Air and Stream Improvement (for the Paper Industry)
NCI	National Cancer Institute
ND	Not Detected (at or above MRL)
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NIH	National Institute of Health
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NPW	Non-Potable Water
NTIS	National Technical Information System
NTP	National Toxicology Program
ODOC (or DOC)	Ongoing Demonstration of Capability / Demonstration of Capability
OSHA	Occupational Safety and Health Administration
PBMS	Performance Based Measurement System
PCBs	Polychlorinated Biphenyls
PE	Performance Evaluation Sample (aka PT sample)
PID	Photoionization Detector
PM	Project Manager includes the Project Manager Assistant (PMA)
PMA	Project Manager Assistant
PQL	Practical Quantitation Limit
PT	Proficiency Testing
PW (or DW)	Potable Water or Drinking water
QA	Quality Assurance
QAM / QSM	Quality Assurance Manual / Quality Systems Manual
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposal
RL	Reporting Limit
RPD	Relative Percent Difference (absolute difference between values) / (average of the values) x 100%
RSD	Relative Standard Deviation (standard deviation / absolute value of mean) x 100%
S (or SC)	Solid (or Solid / Chemical; also Soil or Soil / Chemical)
SD	Serial Dilutions and Standard Deviation depending on context
SIM	Selected Ion Monitoring
SOC	Semi-Volatile Organic Compound
SMO	Sample Management Office (aka Sample Receiving)
SOQ	Statement of Qualifications
SOW	Statement of Work

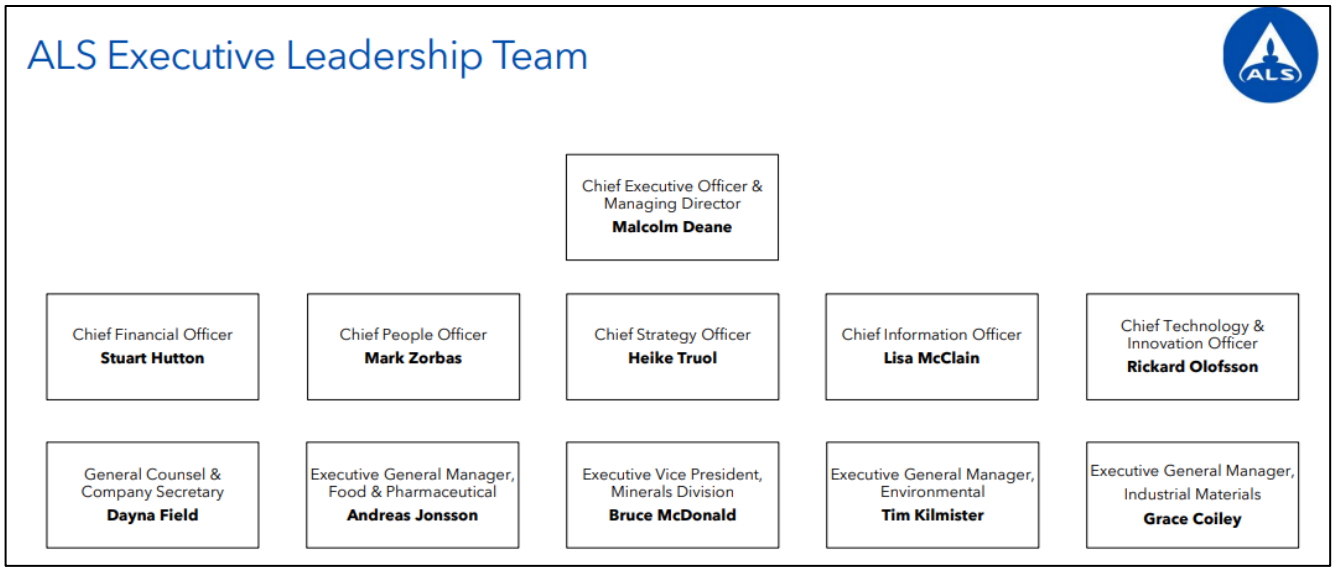
Acronym / Term	Definition
SVOA / SVOC	Semi-Volatile Organic Analyte / Compound
SW-846	Test Methods for Evaluating Solid Waste, Physical / Chemical Methods
TOC	Total Organic Carbon
TOX	Total Organic Halides
TNI	The NELAC Institute
TPH	Total Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
TSS	Total Suspend Solids
TVS	Total Volatile Solids
UST	Underground Storage Tank
UV	Ultraviolet Spectrophotometer
VOA / VOC	Volatile Organic Analyte / Compound
WP	Water Pollution (references testing on non-potable water samples)
WS	Water Supply (references testing on drinking water or potable water samples)
YAL	York Analytical Laboratories Inc.

Units

Unit Symbol	Definition
g/L	grams per Liter
mg/kg	milligrams per Kilogram (same as ppm)
mg/L	milligrams per Liter (same as ppm)
µg/L	micrograms per Liter (same as ppb); sometimes written ug/L
ppb	parts per billion
ppm	parts per million
°C	degrees Celsius (sometimes abbreviated to a “C” next to a number)
°F	degrees Fahrenheit

APPENDIX B – ORGANIZATION CHARTS

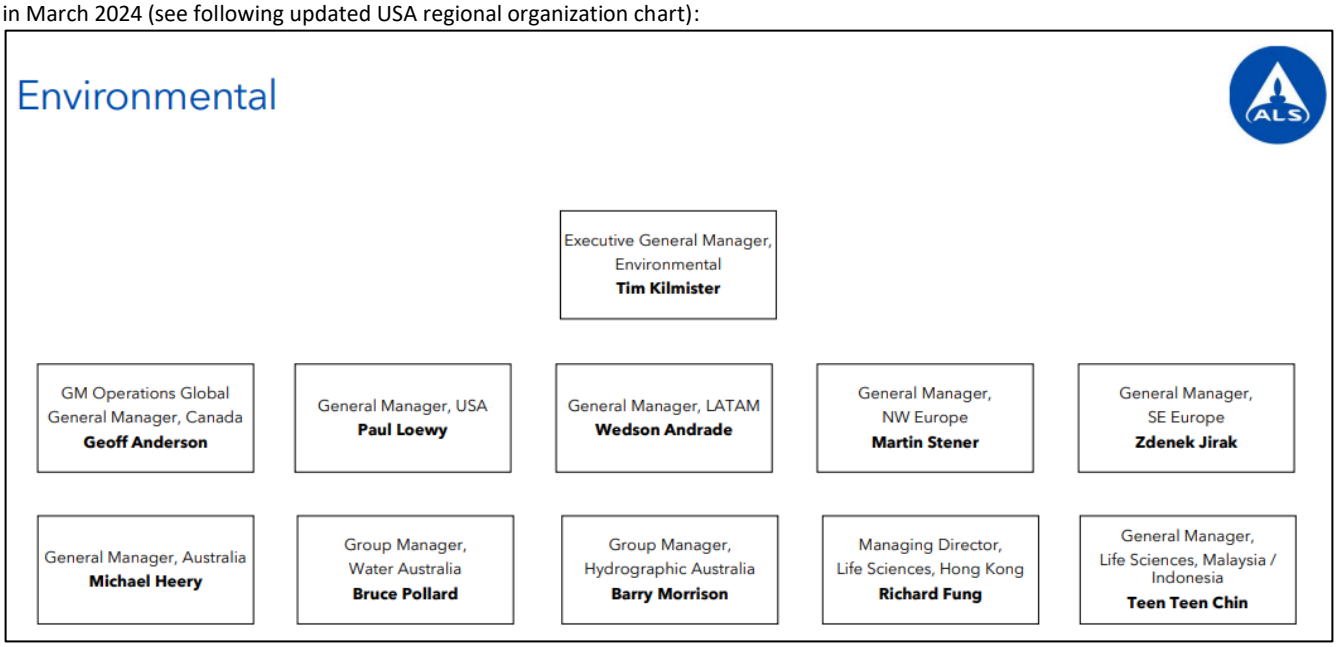
ALS Group Organization (Corporate) effective 10 October 2024:



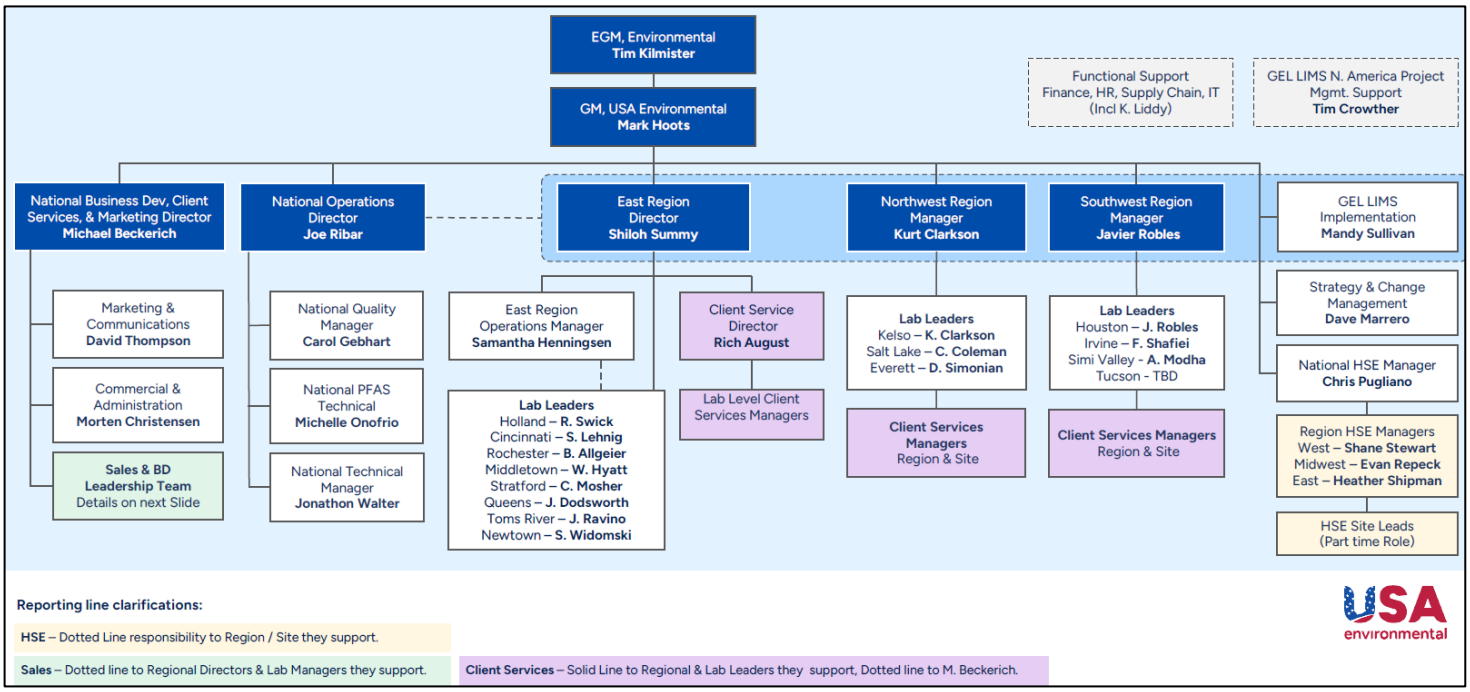
Other organization charts exist for the following Corporate Groups and provide support functions to USA Environmental. The current organization charts are maintained by HR and found on ALSNET under the HR portal for Organisation Structures - All Documents:

- finance
- human resources
- strategy
- information technology
- technology and innovation
- legal

The ALS Environmental Group is global and has the following structure as of 10 October 2024. Paul Loewy was replaced by Mark Hoots in March 2024 (see following updated USA regional organization chart):



National US Environmental Leadership and Business development organization, effective 7 April 2025:



USA Environmental - Business development organization

Roles & responsibilities for maximizing results from our sales focused professionals

Michael Beckerich
National Business Development, Client Services, Marketing & Communication Director

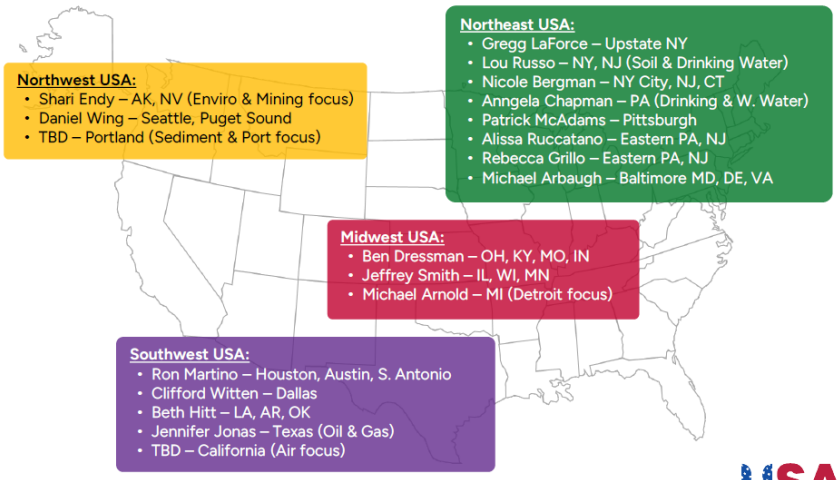
- Direct reporting line with all Regional BD Account Managers, unified to accelerate growth, while remaining synchronized with the Regional Leaders they support.
- Sales strategy development, training, and consistency of execution – aligned between BD, Client Services, and Operations Regional & local Lab Leaders
- Coordinated external-facing strategy for marketing, website, communications & CRM software.
- Development and adjustment of focused strategies for Top Clients, Federal Programs, Products, & Markets.

Morten Christensen
Commercial & Sales Administration Manager

- National Client Relationship Management & assignments.
- CRM Implementation, training, and management
- MSA's - Securing, Managing, & Maximizing.
- RFP Strategy and tracking – Finding and winning large RFPs in target areas & clients.
- Bid Documentation – Supporting sales needs for insurance, commercial questionnaires, licenses, etc.
- Administering Sales measurement & metrics program.

Business Development Account Management Team:

All-Star team of dynamic technical sales leaders who act as a unified force across the USA to develop and expand clients and markets; focused on their assigned region and clients, but optimizing sales growth for all services in USA. Each reports directly to M. Beckerich, dotted line to Regional Business Leader they support.



USA environmental

Stratford Location Organization, effective 14 November 2025:

York Analytical Laboratories, Inc.
Part of ALS Limited

Stratford, CT Laboratory
Reporting Structure

Updated 14 November 2025

Cassie Mosher, Technical Director
reports to Shiloh Summy (East Region Director)
reports indirect to Samantha Henningsen (East Region Operations Manager)
reports indirect to Jonathon Walter (National Technical Manager)

Corey Olsewski, Laboratory Director
reports to Shiloh Summy (East Region Director)
indirect to Samantha Henningsen (East Region operations Manag
and indirect to Jonathon Walter (National Technical manager)

Zachary Scott, Quality Assurance Officer
reports to Cassie Mosher
reports indirect to Carol Gebhart (National Quality Manager) and Anngela Chapman (Assistant National Quality Manager)

Anthony DeCarlo, Wet Chemistry Supervisor

Taylor Dauphinais	***Stacey Lecza*****
Sienne Matregrano (W, Th, F)	*Ali Akbar*
Sam West	*Jackson Forlenza*
James Macisco	*Drhuvil Patel*
Jomar Morales	*Jack Storm*
Buanna Francois (Th, F)	
Christian DiMatteo	

Tom Jenkins, TCLP/SPLP Supervisor

	Jason O'Neill+
	Matthew Domagala++

Jason Tom, Metals Supervisor

Catherine Weed	*Kristina Qubick+*
Danielle Trant	
Ariana Ruffner	

Stephanie Brathwaite, Organics Manager

****Jaycen Munro**, Extractions Supervisor**

John Macdonald	*Joline Alisa*
Andrew Dunning	*Ronnel Brockett+*
Natalie Roadas Palencia	*Nicholas Blanco++*
Alexander Fernandes+	*Matt McGovern++*
Yang Li+	*Alexia Medina++*
Morrigan Timothy	*Danny Devissiere++*

Ben Johnson, GC Supervisor

Gillian Brogan*	*Tarek Abouel-Hassan*
Romanya Joseph	*Nick Fasnakis+*

Sal Rianna, SVOA Supervisor

Ali Lindberg	*Michael Alisa++*

Stephanie Brathwaite, VOA Supervisor

Paige Dostie	*Palak Bhasvar++*
Pruthvi Solanki	
Sarah Ferrante+ (10:00 - 18:30)	

Disposal
Claire Mora
Frazier Achundia

Lea Sherman, Login Supervisor

Noah Soriano^	***Daniel Corales^***
Tom Gabrielson	*McKenzie Elliot*
Lindsay Plude	*Jenny Fogle*
Jorge Cardona	

Key:	
**	*Second Shift Supervisor*
*	*Weekend Supervisor*
^	*Shift Lead*
Name not italicized	*First Shift (8:30-17:00)*
Name Italicized	*Second Shift (M-F 14:30-23:00)*
[Name]	*Site Safety Rep*
+	*Sunday - Thursday*
++	*Tuesday - Saturday*

Deputies:
Laboratory/Technical Director Stephanie Brathwaite
Quality Assurance Officer Cassie Mosher

APPENDIX C – ETHICS AND DATA INTEGRITY ATTESTATION STATEMENT

This is a copy of the Ethics and Data Integrity Attestation Statement that is signed electronically by all Employees after completion of the annual ALSTAR Ethics and Data Integrity Training. Records are maintained in ALSTAR.

ETHICS AND DATA INTEGRITY AGREEMENT

When this document is closed, a message asking that you understood the contents will appear. By selecting "YES" you are indicating that you have understood the Ethics and Data Integrity training course and agree to, and are committed to following each statement. If you disagree select "NO" and discuss further with your Site Leadership team.

I agree that in the performance of my duties at ALS:

1. I shall not intentionally report data values that are not actual values obtained, including but not limited to results, dates, times, and method citations, and data values that do not meet established quality control criteria as set forth in the Method and/or SOP or as defined by company policy or client contract;
2. I shall not intentionally falsify through acts of commission, omission, erasure, or destruction, nor improperly manipulate any sample or QC data in any manner, unless the modification can be technically justified through a measurable analytical process or method acceptable to ALS. All such modifications and their justifications shall be clearly and thoroughly documented in the raw data and/or appropriate laboratory record, and will include my initials or signature and a date (either electronic or hardcopy as appropriate). The original data shall not be obscured but be retained through electronic version history, original save fail, single line cross out, or other appropriate retention method;
3. I shall not intentionally represent another individual's work as my own;
4. I agree to inform ALS of any accidental or intentional reporting of non-authentic data by other employees;
5. I have read and understood this Ethics and Data Integrity training and understand that failure to comply with the conditions stated within will result in disciplinary action, up to and including termination and possible criminal prosecution;
6. I am committed to performing all work assigned to me following ALS approved methods and procedures. I shall not follow hand-written notes or unapproved modifications. If I become aware of such unauthorized documents, I will bring these to the attention of my Supervisor, Lab Director, or Quality Manager immediately;
7. I shall not make false statements to, or seek to otherwise deceive ALS Staff or Clients;
8. I shall not condone any accidental or intentional reporting of unauthentic data by other ALS Staff and will immediately report such occurrences to my Supervisor, Lab Director, Quality Manager, Human Resources, or other ALS Whistleblower options. I understand that failure to report such occurrences may subject me to immediate disciplinary actions, up to and including termination and possible criminal prosecution;
9. If a Supervisor, Manager, Director, or other member of the ALS Leadership Group requests me to engage in or perform an activity that I feel is compromising data integrity, I acknowledge I have the right to refuse the request. I also have the right to appeal this action to other Supervisors, Lab Director, Quality Manager, Human Resources, or ALS Whistleblower options;
10. If my role within ALS includes supervisory or leadership responsibilities, I shall not instruct, request, or direct any subordinate to perform any unethical or non-defensible laboratory practice, nor shall I discourage, intimidate, or inhibit a staff member who may choose to appropriately appeal my instruction, request, or directive;
11. I understand that Employees who report violations of this policy will be kept free from intimidation and recrimination arising from such reporting.

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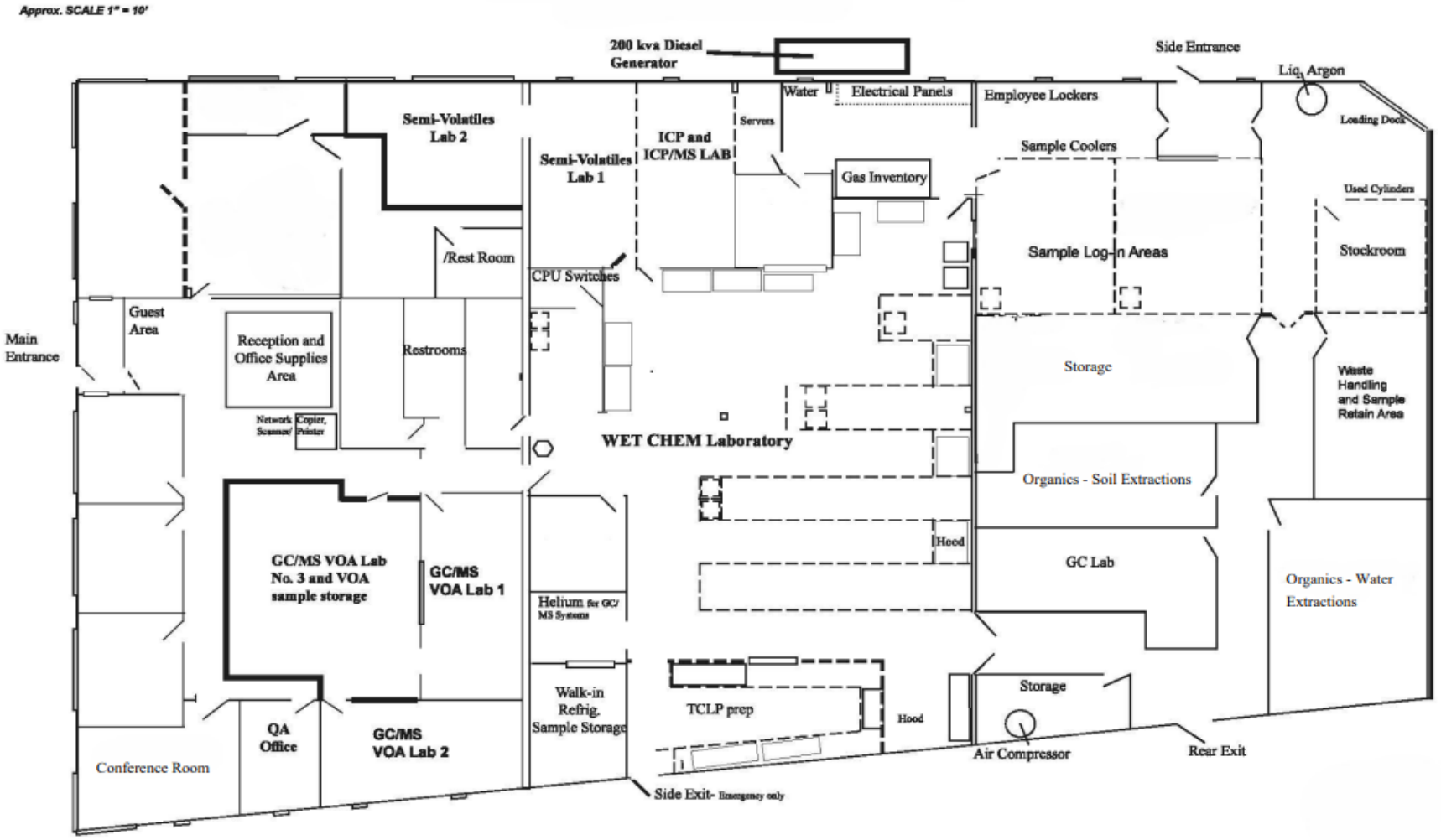
APPENDIX D – LABORATORY FLOOR PLAN

ALS Laboratory - Stratford

120 Research Drive, Stratford, CT 06512



APPENDIX E – STANDARD OPERATING PROCEDURES

The following table summarizes the **ALS Limited Policies and Procedures** that form the foundation of all quality management systems within ALS Environmental USA. These documents are available on the internal secured intranet site (Policies - Grouped By Language (alsglobal.com)). This list is not all inclusive as some ALS Limited Corporate Policies apply to Support Departments such as Financial more than Quality Assurance. These documents are maintained by ALS Corporate.

Document Title	Document Number	Key Topics	Applicable To
ALS Code of Conduct	HR-GL-GRP-POL-001	• ALS commitments and Employee conduct expectations • guidelines for conducting business and interacting with 3rd parties • reporting code of conduct violations and consequences of such violations	All Employees
Anti-Bribery and Anti-Corruption Policy	CAR-GL-GRP-POL-008	ALS tolerance and procedures for: • accepting gifts and entertainment • facilitation of payments • donations and sponsorship • guidelines of interacting with 3rd parties • record keeping • reporting violations or suspicious behavior	ALS employees Sub-Contractors Consultants Agents Business partners of ALS Group
Guidelines for the Prevention of Bribery and Corruption	CAR-GL-GRP-GUI-001	• additional information to support CAR-GL-GRP-POL-008 • defines a series of general rules to avoid bribery and corruption • use of ALS Gift Register	ALS employees Sub-Contractors Consultants Agents Business partners of ALS Group
Business Partner Due Diligence Process	CAR-GL-GRP-PRO-001	• procedure to initiate prior to ALS entering into joint business association (excludes suppliers, contractors, and subcontractors) • expectations and monitoring	General Managers, Corporate Legal, ALS Compliance and Risk Committee, ALS CEO
Charitable Giving Procedure	FIN-GL-GRP-POL-004	• defines the *ALS Charitable Giving Committee* and causes that are supported globally • defines *ALS Cares* program • procedures for due diligence prior to donation, excluding giving, budgets and payments, records, reporting, and monitoring	Senior Roles responsible for authorizing Donations Members of the ALS Charitable Giving Committee
Compliance Policy	CAR-GL-GRP-POL-002	• defines Group Compliance Management program • examples of laws and regulations that could have compliance expectations for ALS • procedures to follow when non-compliance is discovered and reporting requirements	all ALS Employees (role responsibilities in document)
Continuous Disclosure Policy	CAR-GL-GRP-POL-003	• defines policies and procedures that the Board of ALS Limited follows in order to comply with Corporations Act 2001 and ASX Listing Rules	Board of ALS Limited Chief Executive Officers Regional Managers
Data and IT Usage Policy	IT-GL-GRP-POL-001	• compliance and reporting expectations • procedures and expectations for confidentiality, privacy, use of company assets, allocation of username and password, network and system access, use of email and internet services, use of standard hardware and software, remote access	all ALS Employees (role responsibilities in document)

Document Title	Document Number	Key Topics	Applicable To
Delegation of Authority (several)	FIN-GL-GRP-POL-006 (Corporate) FIN-GL-GRP-POL-006B (Corporate + B) FIN-FL-GRP-POL-006C (Corporate + C) FIN-FL-GRP-POL-006D (Corporate + D) FIN-GL-FRP-POL-014 (MARC Tech)	• defines the limits of authority and approval within the ALS Corporate Group for all internal and external transactions • defines the Level A, B, C, and D categories of authority • applies to capital items, operational expenses, property leases, customer tenders / quotations / contractions, formal agreements, credits or write offs, supplier contracts, engagement of contractors / consultants, recruitment, salary, termination, leave approval, personal expense reimbursement, company credit card and travel expenses, charitable donations and sponsorships, etc.	all ALS Employees with spending authorities
Fraud Risk Management Policy	CAR-GL-GRP-POL-023	• defines ALS no tolerance position for fraud • provides overview of control measures to prevent, detect, and respond to fraud	all ALS Employees (role responsibilities in document)
Fraud Control Plan	CAR-GL-GRP-PLN-001	• supplements CAR-GL-GRP-POL-023 • outlines ALS awareness and training plan and internal controls • detection and surveillance requirements • procedures for responding to fraud incidents	all ALS Employees (role responsibilities in document)
Information Management Policy	IT-GL-GRP-POL-002	• Part 1 = confidentiality, security of information, privacy, protection, proper use of company assets • Part 2 = protection and proper use of computer assets, allocation of usernames and passwords, appropriate use of email and internet including installation of software, access control and authorization, remote access • Part 3 = guidance to Business Streams for meeting ISO/IEC 27002:2013	Part 1 = all ALS Employees Part 2 = all ALS Employees who access computer systems Part 3 = all ALS Employees who administer or manage IT systems
Physical Security and Asset Management Standard	HSE-GL-GRP-ST-001	• defines physical security governance program (detect, delay, respond, mitigate, deter) • outlines common threats and risks • procedures for perimeter security, security zones within a facility, key requirements, visitor management, and reporting or responding to suspicious activity and incidents	all ALS Employees (role responsibilities in document)
Privacy Policy	CAR-GL-GRP-POL-001	• details how ALS collects, processes, and manages personal data • defines Employee rights	all ALS Employees (role responsibilities in document)
Procurement Supply Chain Policy	FIN-GL-GRP-POL-019	• expected protocol in dealing with vendors • requirement for vendor consolidation and use of negotiated pricing agreements • inventory management requirements • monitoring compliance	ALS Employees with procurement as part of their role
Quality Management Policy	CAR-GL-GRP-POL-012	• defines 11 processes for ensuring data integrity, confidentiality, and professional ethics	all ALS Employees

Document Title	Document Number	Key Topics	Applicable To
Recruitment Management Guidelines	HR-GL-GRp-GUI-001	• procedures for ensuring the right people are selected for the right positions in a timely manner • defines role of HR • procedures for vacancy assessment, recruitment approval, and job options • guidelines for sourcing options, selection, essential checks, offers, induction, and probationary period	all ALS Employees involved in hiring processes
Risk Appetite and Tolerance Policy	CAR-GL-GRP-POL-011	• defines the appetite for risk and articulates the boundaries around seeking opportunities • minimum requirements for management of risk within ALS	ALS Board, Executive, and Senior Management (regional and local)
Risk Management Policy	CAR-GL-GRP-POL-007	• outlines a risk management strategy considering the appetite and tolerance of ALS • complies with ISO 31000:2018	all ALS Employees involved in business decision making processes
Sanctions Policy	CAR-GL-GRP-POL-015	• outlines ALS commitments to complying with economic and trade sanctions applicable in the conduct of business	ALS Employees with procurement as part of their role
Securities Trading Policy	CAR-GL-GRP-POL-006	• guidelines and procedures to be adopted whenever company personnel intend to trade in ALS securities	all ALS Employees
Social Media Policy	HR-GL-GRP-POL-005	• provides 8 criteria for Employees to follow in using Social Media • consequences for violations • expectations when making reference to ALS on social media	all ALS Employees
Supplier Code of Conduct Policy	CAR-GL-GRP-POL-019	• defines expectations for ALS Vendors to ensure alignment to the ALS Code of Conduct • outlines 5 key requirements for Vendors • how to obtain Vendor acceptance and commitment	ALS Employees with procurement as part of their role
Whistleblower Policy	CAR-GL-GRP-POL-005	• explains how to report instances of suspicious, unethical, or fraudulent behavior without fear of retaliation • includes use of a 3rd party hotline • how genuine and false reports are handled and procedure for investigation and reporting to the Board and Risk Committee	all ALS Employees

APPENDIX F - Laboratory Accreditations

Scope of Program	Accreditation Body	AB Assigned Lab ID	General Scope of Program
State	Connecticut	PH-0840	Primary accreditation for DW, NPW, and SCM through NY
State	NELAP – New York	10854	Primary accreditation for DW, NPW, and SCM through NY
State	NELAP – New Jersey	CT005	Primary accreditation for DW, NPW, and SCM through NY; secondary through NJ
State	NELAP – Pennsylvania	68-04440	Primary accreditation for NPW and SCM through NY; secondary through PA.
State	ELAP	10854	Primary accreditation for Total Organic Carbon and Lead in Paint and Wipes through NY

DW = Drinking Water
NPW = Non-potable Water
SCM = Solid and Chemical Materials

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2026
Issued April 01, 2025
Revised January 27, 2026

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
ALS ENVIRONMENTAL - STRATFORD
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Fuel Additives

Methyl tert-butyl ether	EPA 524.2
Naphthalene	EPA 524.2

Metals I

Arsenic, Total	EPA 200.8 Rev. 5.4
Barium, Total	EPA 200.7 Rev. 4.4
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.8 Rev. 5.4
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Mercury, Total	EPA 245.1 Rev. 3.0
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Zinc, Total	EPA 200.7 Rev. 4.4

Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Antimony, Total	EPA 200.8 Rev. 5.4
Beryllium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Molybdenum, Total	EPA 200.8 Rev. 5.4

Serial No.: 71590

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Metals II

Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Thallium, Total	EPA 200.8 Rev. 5.4
Vanadium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Metals III

Calcium, Total	EPA 200.7 Rev. 4.4
Magnesium, Total	EPA 200.7 Rev. 4.4
Potassium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4

Miscellaneous

1,4-Dioxane	EPA 522
Turbidity	EPA 180.1 Rev. 2.0

Non-Metals

Alkalinity	SM 21-23 2320B (-97)
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	EPA 300.0 Rev. 2.1
Color	SM 21-23 2120B (-01)
Fluoride, Total	EPA 300.0 Rev. 2.1
Orthophosphate (as P)	EPA 300.0 Rev. 2.1
	SM 19, 21-23 4500-P E (-99)
Solids, Total Dissolved	SM 21-23 2540C (-97)
Specific Conductance	EPA 120.1 Rev. 1982
Sulfate (as SO4)	EPA 300.0 Rev. 2.1

Trihalomethanes

Bromodichloromethane	EPA 524.2

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Trihalomethanes

Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2
Total Trihalomethanes	EPA 524.2

Volatile Aromatics

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2

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Volatile Aromatics	
Total Xylenes	EPA 524.2
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2
2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2

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Volatile Halocarbons

Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2

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All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 8260D
	EPA 624.1
Acrylonitrile	EPA 8260D
	EPA 624.1
Methyl methacrylate	EPA 8260D

Amines

1,2-Diphenylhydrazine	EPA 8270E
2-Nitroaniline	EPA 8270E
3-Nitroaniline	EPA 8270E
4-Chloroaniline	EPA 8270E
4-Nitroaniline	EPA 8270E
Aniline	EPA 625.1
	EPA 8270E
Carbazole	EPA 625.1
	EPA 8270E
Diphenylamine	EPA 8270E
Pyridine	EPA 625.1
	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 625.1
	EPA 8270E
Benzidine	EPA 625.1
	EPA 8270E

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
	EPA 608.3

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All approved analytes are listed below:

Chlorinated Hydrocarbon Pesticides

4,4'-DDE	EPA 8081B
	EPA 608.3
4,4'-DDT	EPA 8081B
	EPA 608.3
Aldrin	EPA 8081B
	EPA 608.3
alpha-BHC	EPA 8081B
	EPA 608.3
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B
	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3
delta-BHC	EPA 8081B
	EPA 608.3
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B
	EPA 608.3
Endosulfan II	EPA 8081B
	EPA 608.3
Endosulfan sulfate	EPA 8081B
	EPA 608.3
Endrin	EPA 8081B
	EPA 608.3
Endrin aldehyde	EPA 8081B
	EPA 608.3

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Chlorinated Hydrocarbon Pesticides

Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
	EPA 608.3
Heptachlor epoxide	EPA 8081B
	EPA 608.3
Lindane	EPA 8081B
	EPA 608.3
Methoxychlor	EPA 8081B
	EPA 608.3
Mirex	EPA 8081B
Toxaphene	EPA 8081B
	EPA 608.3

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
1,2,4,5-Tetrachlorobenzene	EPA 8270E
1,2,4-Trichlorobenzene	EPA 625.1
	EPA 8270E
2-Chloronaphthalene	EPA 625.1
	EPA 8270E
Hexachlorobenzene	EPA 8270E
Hexachlorobutadiene	EPA 625.1
	EPA 8270E
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270E
Hexachloroethane	EPA 625.1
	EPA 8270E

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Chlorinated Hydrocarbons	
Pentachlorobenzene	EPA 8270E
Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
	SM 6640B-2006
2,4-D	EPA 8151A
Dicamba	EPA 8151A
Demand	
Biochemical Oxygen Demand	SM 5210B-2016
Carbonaceous BOD	SM 5210B-2016
Chemical Oxygen Demand	SM 5220D-2011
Fuel Oxygenates	
Di-isopropyl ether	EPA 8260D
Ethanol	EPA 8260D
Methyl tert-butyl ether	EPA 8260D
tert-amyl alcohol	EPA 8260D
tert-amyl methyl ether (TAME)	EPA 8260D
tert-butyl alcohol	EPA 8260D
tert-butyl ethyl ether (ETBE)	EPA 8260D
Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 625.1
	EPA 8270E
4-Bromophenylphenyl ether	EPA 625.1
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 625.1
	EPA 8270E

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Haloethers

Bis(2-chloroethoxy)methane	EPA 625.1
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 625.1
	EPA 8270E

Low Level Polynuclear Aromatics

Acenaphthene Low Level	EPA 8270E
	EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270E
	EPA 8270E SIM
Anthracene Low Level	EPA 8270E
	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270E
	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270E
	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270E
	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270E
	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270E
	EPA 8270E SIM
Chrysene Low Level	EPA 8270E
	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270E
	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270E
	EPA 8270E SIM

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Low Level Polynuclear Aromatics

Fluorene Low Level	EPA 8270E
	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270E
	EPA 8270E SIM
Naphthalene Low Level	EPA 8270E
	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270E
	EPA 8270E SIM
Pyrene Low Level	EPA 8270E
	EPA 8270E SIM

Metals I

Barium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Cadmium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Calcium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
Chromium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Copper, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D

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Metals I

Copper, Total	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Iron, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Lead, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Magnesium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
Manganese, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Nickel, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Potassium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
Silver, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Sodium, Total	EPA 200.7, Rev. 4.4 (1994)

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Metals I

Sodium, Total	EPA 6010D

Metals II

Aluminum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Antimony, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Arsenic, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Beryllium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Chromium VI	EPA 7196A
	SM 3500-Cr B-2011
Mercury, Total	EPA 245.1, Rev. 3.0 (1994)
	EPA 7470A
	EPA 7473
Selenium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
Vanadium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D

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WADSWORTH CENTER

Expires 12:01 AM April 01, 2026
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Revised December 15, 2025

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Metals II

Vanadium, Total	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Zinc, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Metals III

Cobalt, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Molybdenum, Total	EPA 200.8, Rev. 5.4 (1994)
Thallium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Tin, Total	EPA 200.8, Rev. 5.4 (1994)
Titanium, Total	EPA 200.8, Rev. 5.4 (1994)

Mineral

Alkalinity	SM 2320B-2011
Calcium Hardness	EPA 200.7, Rev. 4.4 (1994)
Chloride	EPA 300.0, Rev. 2.1 (1993)
Fluoride, Total	EPA 300.0, Rev. 2.1 (1993)
Hardness, Total	SM 2340B-2011
Sulfate (as SO4)	EPA 300.0, Rev. 2.1 (1993)

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Miscellaneous

Boron, Total	EPA 200.8, Rev. 5.4 (1994)
Bromide	EPA 300.0, Rev. 2.1 (1993)
Color	SM 2120B-2011
Cyanide, Total	SM 4500-CN E-2016
non-Polar Extractable Material (TPH)	EPA 1664A
Oil and Grease Total Recoverable	EPA 1664A
Phenols	EPA 420.1 (Rev. 1978)
Specific Conductance	EPA 120.1 (Rev. 1982)
Sulfide (as S)	SM 4500-S2- F-2011
Surfactant (MBAS)	SM 5540C-2011
Turbidity	EPA 180.1, Rev. 2.0 (1993)

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 625.1
	EPA 8270E
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270E
Isophorone	EPA 625.1
	EPA 8270E
Nitrobenzene	EPA 625.1
	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 625.1
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 625.1
	EPA 8270E
N-Nitrosodiphenylamine	EPA 625.1

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Nitrosoamines	
N-Nitrosodiphenylamine	EPA 8270E
Nutrient	
Ammonia (as N)	SM 4500-NH3 D-2011 or E-2011
Kjeldahl Nitrogen, Total	SM 4500-N Org D-2011
	SM 4500-NH3 D-2011 or E-2011
Nitrate (as N)	EPA 300.0, Rev. 2.1 (1993)
Nitrate-Nitrite (as N)	EPA 300.0, Rev. 2.1 (1993)
Nitrite (as N)	EPA 300.0, Rev. 2.1 (1993)
Orthophosphate (as P)	EPA 300.0, Rev. 2.1 (1993)
	SM 4500-P E-2011
Phosphorus, Total	SM 4500-P E-2011
Organophosphate Pesticides	
Atrazine	EPA 8270E
Parathion ethyl	EPA 8270E
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 625.1
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1
	EPA 8270E
Diethyl phthalate	EPA 625.1
	EPA 8270E
Dimethyl phthalate	EPA 625.1
	EPA 8270E

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Phthalate Esters

Di-n-butyl phthalate	EPA 625.1
	EPA 8270E
Di-n-octyl phthalate	EPA 625.1
	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
	EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A
	EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A
	EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A
	EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A
	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A

Polynuclear Aromatics

Acenaphthene	EPA 625.1
	EPA 8270E
Acenaphthylene	EPA 625.1
	EPA 8270E

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Polynuclear Aromatics

Anthracene	EPA 625.1
	EPA 8270E
Benzo(a)anthracene	EPA 625.1
	EPA 8270E
Benzo(a)pyrene	EPA 625.1
	EPA 8270E
Benzo(b)fluoranthene	EPA 625.1
	EPA 8270E
Benzo(g,h,i)perylene	EPA 625.1
	EPA 8270E
Benzo(k)fluoranthene	EPA 625.1
	EPA 8270E
Chrysene	EPA 625.1
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 625.1
	EPA 8270E
Fluoranthene	EPA 625.1
	EPA 8270E
Fluorene	EPA 625.1
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 625.1
	EPA 8270E
Naphthalene	EPA 625.1
	EPA 8270E
Phenanthrene	EPA 8270E
Pyrene	EPA 625.1
	EPA 8270E

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Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270E
2,4,5-Trichlorophenol	EPA 625.1
	EPA 8270E
2,4,6-Trichlorophenol	EPA 625.1
	EPA 8270E
2,4-Dichlorophenol	EPA 625.1
	EPA 8270E
2,4-Dimethylphenol	EPA 625.1
	EPA 8270E
2,4-Dinitrophenol	EPA 8270E
2-Chlorophenol	EPA 625.1
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270E
2-Methylphenol	EPA 625.1
	EPA 8270E
2-Nitrophenol	EPA 625.1
	EPA 8270E
4-Chloro-3-methylphenol	EPA 625.1
	EPA 8270E
4-Methylphenol	EPA 625.1
	EPA 8270E
4-Nitrophenol	EPA 625.1
	EPA 8270E
Cresols, Total	EPA 8270E
Pentachlorophenol	EPA 625.1
	EPA 8270E

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Priority Pollutant Phenols

Phenol	EPA 625.1
	EPA 8270E

Residue

Settleable Solids	SM 2540 F-2015
Solids, Total	SM 2540 B-2015
Solids, Total Dissolved	SM 2540 C-2015
Solids, Total Suspended	SM 2540 D-2015

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270E
2-Methylnaphthalene	EPA 8270E
Acetophenone	EPA 8270E
alpha-Terpineol	EPA 625.1
	EPA 8270E
Benzaldehyde	EPA 8270E
Benzoic Acid	EPA 8270E
Benzyl alcohol	EPA 8270E
Caprolactam	EPA 8270E
Dibenzofuran	EPA 8270E

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
1,2,4-Trimethylbenzene	EPA 8260D
1,2-Dichlorobenzene	EPA 8260D
	EPA 624.1

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Volatile Aromatics

1,3,5-Trimethylbenzene	EPA 8260D
1,3-Dichlorobenzene	EPA 8260D
	EPA 624.1
1,4-Dichlorobenzene	EPA 8260D
	EPA 624.1
2-Chlorotoluene	EPA 8260D
4-Chlorotoluene	EPA 8260D
Benzene	EPA 8260D
	EPA 624.1
Bromobenzene	EPA 8260D
Chlorobenzene	EPA 8260D
	EPA 624.1
Ethyl benzene	EPA 8260D
	EPA 624.1
Isopropylbenzene	EPA 8260D
m/p-Xylenes	EPA 8260D
	EPA 624.1
Naphthalene, Volatile	EPA 8260D
n-Butylbenzene	EPA 8260D
n-Propylbenzene	EPA 8260D
o-Xylene	EPA 8260D
	EPA 624.1
p-Isopropyltoluene (P-Cymene)	EPA 8260D
sec-Butylbenzene	EPA 8260D
Styrene	EPA 8260D
	EPA 624.1
tert-Butylbenzene	EPA 8260D

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Volatile Aromatics

Toluene	EPA 8260D
	EPA 624.1
Total Xylenes	EPA 8260D
	EPA 624.1

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
1,1,1-Trichloroethane	EPA 8260D
	EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
1,1,2-Trichloroethane	EPA 8260D
	EPA 624.1
1,1-Dichloroethane	EPA 8260D
	EPA 624.1
1,1-Dichloroethene	EPA 8260D
	EPA 624.1
1,1-Dichloropropene	EPA 8260D
1,2,3-Trichloropropane	EPA 8260D
1,2-Dibromo-3-chloropropane	EPA 8260D
1,2-Dibromoethane	EPA 8260D
1,2-Dichloroethane	EPA 8260D
	EPA 624.1
1,2-Dichloropropane	EPA 8260D
	EPA 624.1
1,3-Dichloropropane	EPA 8260D
2,2-Dichloropropane	EPA 8260D

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Volatile Halocarbons

2-Chloroethylvinyl ether	EPA 8260D
	EPA 624.1
Bromochloromethane	EPA 8260D
Bromodichloromethane	EPA 8260D
	EPA 624.1
Bromoform	EPA 8260D
	EPA 624.1
Bromomethane	EPA 8260D
	EPA 624.1
Carbon tetrachloride	EPA 8260D
	EPA 624.1
Chloroethane	EPA 8260D
	EPA 624.1
Chloroform	EPA 8260D
	EPA 624.1
Chloromethane	EPA 8260D
	EPA 624.1
cis-1,2-Dichloroethene	EPA 8260D
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260D
	EPA 624.1
Dibromochloromethane	EPA 8260D
	EPA 624.1
Dibromomethane	EPA 8260D
Dichlorodifluoromethane	EPA 8260D
	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260D

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Volatile Halocarbons

Methylene chloride	EPA 8260D
	EPA 624.1
Tetrachloroethene	EPA 8260D
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260D
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260D
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260D
Trichloroethene	EPA 8260D
	EPA 624.1
Trichlorofluoromethane	EPA 8260D
	EPA 624.1
Vinyl chloride	EPA 8260D
	EPA 624.1

Volatiles Organics

1,4-Dioxane	EPA 8260D
	EPA 8270E
	EPA 8270E SIM
2-Butanone (Methylethyl ketone)	EPA 8260D
2-Hexanone	EPA 8260D
4-Methyl-2-Pentanone	EPA 8260D
Acetone	EPA 8260D
Carbon Disulfide	EPA 8260D
Cyclohexane	EPA 8260D
Methyl acetate	EPA 8260D
Methyl cyclohexane	EPA 8260D

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Volatiles Organics

Vinyl acetate	EPA 8260D

Sample Preparation Methods

SM 4500-P B(5)-2011
EPA 5030C
SM 4500-CN B-2016 and C-2016
EPA 3015A
EPA 3010A
EPA 3510C
SM 4500-N Org B-2011 or C-2011

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All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 8260D
Acrylonitrile	EPA 8260D
Methyl methacrylate	EPA 8260D

Amines

1,2-Diphenylhydrazine	EPA 8270E
2-Nitroaniline	EPA 8270E
3-Nitroaniline	EPA 8270E
4-Chloroaniline	EPA 8270E
4-Nitroaniline	EPA 8270E
Aniline	EPA 8270E
Carbazole	EPA 8270E
Diphenylamine	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 8270E
Benzidine	EPA 8270E

Characteristic Testing

Corrosivity (pH)	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B

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WADSWORTH CENTER

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MS. CATHERINE L. MOSHER
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
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Chlorinated Hydrocarbon Pesticides

alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270E
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
1,2,4,5-Tetrachlorobenzene	EPA 8270D
	EPA 8270E
1,2,4-Trichlorobenzene	EPA 8270E
2-Chloronaphthalene	EPA 8270E
Hexachlorobenzene	EPA 8270E

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Chlorinated Hydrocarbons

Hexachlorobutadiene	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270E
Hexachloroethane	EPA 8270E

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270E

Metals I

Barium, Total	EPA 6010D
	EPA 6020B
Cadmium, Total	EPA 6010D
	EPA 6020B
Calcium, Total	EPA 6010D
Chromium, Total	EPA 6010D
	EPA 6020B
Copper, Total	EPA 6010D
	EPA 6020B
Iron, Total	EPA 6010D
Lead, Total	EPA 6010D

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Metals I

Lead, Total	EPA 6020B
Magnesium, Total	EPA 6010D
Manganese, Total	EPA 6010D
	EPA 6020B
Nickel, Total	EPA 6010D
	EPA 6020B
Potassium, Total	EPA 6010D
Silver, Total	EPA 6010D
	EPA 6020B
Sodium, Total	EPA 6010D

Metals II

Aluminum, Total	EPA 6010D
	EPA 6020B
Antimony, Total	EPA 6010D
	EPA 6020B
Arsenic, Total	EPA 6010D
	EPA 6020B
Beryllium, Total	EPA 6010D
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471B
	EPA 7473
Selenium, Total	EPA 6010D
	EPA 6020B
Vanadium, Total	EPA 6010D
	EPA 6020B
Zinc, Total	EPA 6010D
	EPA 6020B

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Metals III	
Cobalt, Total	EPA 6010D
	EPA 6020B
Thallium, Total	EPA 6010D
	EPA 6020B
Tin, Total	EPA 6020B
Miscellaneous	
Boron, Total	EPA 6020B
Cyanide, Total	EPA 9014
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 8270E
2,6-Dinitrotoluene	EPA 8270E
Isophorone	EPA 8270E
Nitrobenzene	EPA 8270E
Pyridine	EPA 8270E
Nitrosoamines	
N-Nitrosodimethylamine	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270E
Organophosphate Pesticides	
Parathion ethyl	EPA 8270E
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270E

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Phthalate Esters

Bis(2-ethylhexyl) phthalate	EPA 8270E
Diethyl phthalate	EPA 8270E
Dimethyl phthalate	EPA 8270E
Di-n-butyl phthalate	EPA 8270E
Di-n-octyl phthalate	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A

Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270E

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Polynuclear Aromatic Hydrocarbons

Acenaphthylene	EPA 8270E
Anthracene	EPA 8270E
Benzo(a)anthracene	EPA 8270E
Benzo(a)pyrene	EPA 8270E
Benzo(b)fluoranthene	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270E
Benzo(k)fluoranthene	EPA 8270E
Chrysene	EPA 8270E
Dibenzo(a,h)anthracene	EPA 8270E
Fluoranthene	EPA 8270E
Fluorene	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270E
Naphthalene	EPA 8270E
Phenanthrene	EPA 8270E
Pyrene	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270E
2,4,5-Trichlorophenol	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270E
2,4-Dichlorophenol	EPA 8270E
2,4-Dimethylphenol	EPA 8270E
2,4-Dinitrophenol	EPA 8270E
2-Chlorophenol	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270E
2-Methylphenol	EPA 8270E
2-Nitrophenol	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270E

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Priority Pollutant Phenols

4-Methylphenol	EPA 8270E
4-Nitrophenol	EPA 8270E
Pentachlorophenol	EPA 8270E
Phenol	EPA 8270E

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270E
2-Methylnaphthalene	EPA 8270E
Acetophenone	EPA 8270E
Benzaldehyde	EPA 8270E
Benzoic Acid	EPA 8270E
Benzyl alcohol	EPA 8270E
Caprolactam	EPA 8270E
Dibenzofuran	EPA 8270E

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
1,2,4-Trimethylbenzene	EPA 8260D
1,2-Dichlorobenzene	EPA 8260D
1,3,5-Trimethylbenzene	EPA 8260D
1,3-Dichlorobenzene	EPA 8260D
1,4-Dichlorobenzene	EPA 8260D
2-Chlorotoluene	EPA 8260D
4-Chlorotoluene	EPA 8260D
Benzene	EPA 8260D

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Volatile Aromatics

Bromobenzene	EPA 8260D
Chlorobenzene	EPA 8260D
Ethyl benzene	EPA 8260D
Isopropylbenzene	EPA 8260D
m/p-Xylenes	EPA 8260D
Naphthalene, Volatile	EPA 8260D
n-Butylbenzene	EPA 8260D
n-Propylbenzene	EPA 8260D
o-Xylene	EPA 8260D
p-Isopropyltoluene (P-Cymene)	EPA 8260D
sec-Butylbenzene	EPA 8260D
Styrene	EPA 8260D
tert-Butylbenzene	EPA 8260D
Toluene	EPA 8260D
Total Xylenes	EPA 8260D

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
1,1,1-Trichloroethane	EPA 8260D
1,1,2,2-Tetrachloroethane	EPA 8260D
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
1,1,2-Trichloroethane	EPA 8260D
1,1-Dichloroethane	EPA 8260D
1,1-Dichloroethene	EPA 8260D
1,1-Dichloropropene	EPA 8260D
1,2,3-Trichloropropane	EPA 8260D
1,2-Dibromo-3-chloropropane	EPA 8260D
1,2-Dibromoethane	EPA 8260D

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Volatile Halocarbons

1,2-Dichloroethane	EPA 8260D
1,2-Dichloropropane	EPA 8260D
1,3-Dichloropropane	EPA 8260D
2,2-Dichloropropane	EPA 8260D
2-Chloroethylvinyl ether	EPA 8260D
Bromochloromethane	EPA 8260D
Bromodichloromethane	EPA 8260D
Bromoform	EPA 8260D
Bromomethane	EPA 8260D
Carbon tetrachloride	EPA 8260D
Chloroethane	EPA 8260D
Chloroform	EPA 8260D
Chloromethane	EPA 8260D
cis-1,2-Dichloroethene	EPA 8260D
cis-1,3-Dichloropropene	EPA 8260D
Dibromochloromethane	EPA 8260D
Dibromomethane	EPA 8260D
Dichlorodifluoromethane	EPA 8260D
Hexachlorobutadiene, Volatile	EPA 8260D
Methylene chloride	EPA 8260D
Tetrachloroethene	EPA 8260D
trans-1,2-Dichloroethene	EPA 8260D
trans-1,3-Dichloropropene	EPA 8260D
Trichloroethene	EPA 8260D
Trichlorofluoromethane	EPA 8260D
Vinyl chloride	EPA 8260D

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Volatile Organics

1,4-Dioxane	EPA 8260D
	EPA 8270E
	EPA 8270E SIM
2-Butanone (Methylethyl ketone)	EPA 8260D
2-Hexanone	EPA 8260D
4-Methyl-2-Pentanone	EPA 8260D
Acetone	EPA 8260D
Carbon Disulfide	EPA 8260D
Cyclohexane	EPA 8260D
Methyl acetate	EPA 8260D
Methyl cyclohexane	EPA 8260D
Methyl tert-butyl ether	EPA 8260D
tert-butyl alcohol	EPA 8260D
Vinyl acetate	EPA 8260D

Sample Preparation Methods

EPA 5035A-L
EPA 5035A-H
EPA 3580A
EPA 3010A
EPA 3050B
EPA 3550C
EPA 3546
EPA 3060A
EPA 9010C

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Appendix H
Community Air Monitoring Plan

COMMUNITY AIR MONITORING PLAN (CAMP)

3083 Webster Ave BCP Site
3083 Webster Avenue
Block 3331; Lot 57
Bronx, NY 10467

NYSDEC Site Number: C203184

1. Introduction

The Community Air Monitoring Plan (CAMP) has been prepared by HydroTech Environmental Engineering and Geology, DPC (HydroTech) in accordance with the New York State Department of Health (NYSDOH) Generic CAMP to monitor the air quality during the intrusive activities proposed as a part of the Brownfield Cleanup Program (BCP) Remedial Action Work Plan (RAWP) activities at 3083 Webster Ave BCP Site located at 3083 Webster Avenue, in Bronx, New York (Site #203184). Levels of VOCs and dust in the air will be monitored continuously and periodically by HydroTech personnel utilizing three Aethair® air quality monitors with Environet web-based environmental data management platform on a daily basis. Each unit of this air monitoring product is equipped with a Photo Ionization Detector (PID) and Real-Time Particulate Dust Tracker and will record real-time air quality monitoring data and calculate 15-minute averages. The platform is equipped with a wireless telemetry that will transmit a signal to HydroTech personnel indicating exceedance of the action levels.

For this investigation, the PID will be calibrated at the beginning of each day to the compound isobutylene, which is published by the manufacturer. The PID has a minimum detection limit of 0.1 parts per million (ppm). The Dust Tracker provides real-time measurement based on 90° light scattering. The Dust Tracker has a minimum detection limit of 0.001 mg/m^3.

Continuous real-time air monitoring for VOCs and particulate levels at the perimeter of the exclusion zone or work area will be performed for all ground intrusive activities. Ground intrusive activities include, but are not limited to drilling activities, and soil excavation, stockpiling, movement, hauling and disposal.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of endpoint soil samples. For instance, periodic monitoring during sample collection will consist of taking a reading upon arrival at a sample location. Depending upon the proximity of potentially exposed individuals or occupied structures, continuous monitoring may be performed during sampling activities.

Special CAMP provisions will be implemented for invasive work taking place within 20 feet of potentially exposed individuals or structures. Exceedances of action levels

observed during performance of the CAMP will be reported to the New York State Department of Environmental Conservation (NYSDEC) and recorded in a field daily log. CAMP data will be reported to NYSDEC and the New York State Department of Health (NYSDOH) via daily reports describing any CAMP exceedances and actions taken to correct the issue. A summary of daily CAMP logs/reports will also be provided in the Final Engineering Report (FER).

2. VOCs Monitoring, Response Levels And Actions

VOCs will be monitored at the upwind perimeter and the downwind perimeter of the immediate work area (i.e., the exclusion zone) and also within 20 feet from potentially exposed off-site individuals or structures. Monitoring will be performed on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a PID, which will be calibrated at least daily for the compound isobutylene. The PID will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone or 20 feet from potentially exposed off-site individuals or structures exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

If total organic vapor levels at the downwind perimeter of the work area or exclusion zone or 20 feet from potentially exposed off-site individuals or structures persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will 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.

Activities will be shut down if the organic vapor level at the perimeter of the work area is above 25 ppm.

3. PM Monitoring, Response Levels And Actions

Particulate concentrations will be monitored continuously at the upwind perimeter and the downwind perimeter of the exclusion zone and also within 20 feet from potentially exposed off-site individuals or structures. The particulate monitoring will be performed using a Dust Tracker 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. In addition, fugitive dust migration should be visually assessed during all work activities.

If the PM-10 particulate level downwind or 20 feet from potentially exposed off-site individuals or structures 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 will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels are not 150 mcg/m^3 or greater above the upwind level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression techniques, PM-10 particulate levels downwind or 20 feet from potentially exposed off-site individuals or structures are 150 mcg/m^3 or greater above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration. All readings will be recorded in a daily field log.

4. Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, mobile PID monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with the appropriate pre-determined response levels (response actions should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the work.

If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m^3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m^3 or less at the monitoring point.

Depending on the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Appendix I

Resumes of Key Personnel

TAREK Z. KHOURI, P.E.

Senior Environmental Engineer

Mr. Khouri boasts over 30 years of experience in engineering, real estate development, and construction. His extensive background involves providing environmental consulting services to a broad clientele, including public and private sector entities, developers, and government agencies.

Tarek has participated in and directly managed the remediation and reuse of contaminated properties for over 30 years. He has performed, directed, and overseen environmental investigations and remedial actions at petroleum and chlorinated solvent spill sites, fuel farms, refineries, former manufactured gas, landfills, and a variety of residential, commercial and industrial settings.

Tarek has been the lead designer for the past 20 years in NYC working under the jurisdiction of NYC OER, NYS DEC, and NYC DEP designing, installing, and overseeing the operations of engineering controls such as vapor barriers, SSDS, and SVE systems.

PROJECTS

Environmental Impact Assessments, Phase I ESAs, and Phase II ESIs, Clients: Developers, Property Managers, Environmental Attorneys, Architects, Banks, and Insurance Firms Conducted 100s of environmental assessments for various entities specializing in urban renewal: Mixed use, residential, commercial, warehouses, manufacturing facilities, gas stations and vacant lands. He also designed and executed subsurface investigations for soil, groundwater, and soil gas.

Remedial Investigation, Remedial Design and Associated Remediation Projects - Clients: Developers, Property Managers, Environmental Attorneys, Architects, Banks, Insurance Firms – Managing myriads of environmental investigations and remedial actions at petroleum and chlorinated solvent spill sites, former manufactured gas and a variety of other commercial and industrial settings. Constituents of concern have included LNAPLs and DNAPLs, petroleum hydrocarbons, chlorinated solvents, soil vapor, coal tar, creosote, PCBs, and metals. Managing and participating in historical research, sample collection and data evaluation, synthesis of information to determine site-specific cleanup levels, remedial technology evaluation, design of treatment systems, engineering controls, site cleanup, installation and operation of treatment systems, optimizing systems, and performance monitoring.

SPECIAL COMPETENCIES

Environmental Engineering
Permitting
Utility Coordination
Construction Oversite
Constructability Review
Remediation Design
Operation and Risk Management

TOTAL YEARS OF EXPERIENCE

30

EDUCATION

M.S. Environmental Engineering, University of Central Florida

B.S. Chemistry, University of Central Florida

PROFESSIONAL REGISTRATION

Professional Engineer (P.E.)
New York
Connecticut
Massachusetts
New Jersey
Pennsylvania

SIR T - Band Radio System Replacement at 7 Stations in the Borough of Staten Island, New York, NY - Client: MTA – NYCT Serving as the Environmental Manager with the technical authority for overseeing the implementation of environmental compliance throughout final design and planning, permitting execution, and construction of the Project. Providing planning, field control measures, oversight, and reporting for the following activities: Storm water management, spill prevention and response, erosion and sedimentation control, air emissions and dust control, noise and vibration control, and non-hazardous solid waste and hazardous waste management (Naturally Occurring Asbestos, Lead, Silica, etc.). Construction Cost: $24 Millions

Constructability Review – Justice Sonia Sotomayor Houses, New York City Housing Authority (NYCHA), Bronx, New York Constructability Review for the upgrading/rehabilitation of the Justice Sonia Sotomayor Houses in the Bronx for the New York City Housing Authority (NYCHA). The scope of work includes repairs such as Local Law 11 Brick Facade repair/waterproofing for areas of significant disrepair (including brick masonry, window sills/lintels, and brick parapet replacement with metal railing); roof replacement (asbestos abatement, 4-ply insulated roofing, roof drains); interior repairs/sheet rock/painting to apartments with water damage, new window installation at all locations; replacement of the water tanks, pumps, and repairs to the water tank structures in particular buildings, repairs to the property's main loop and improvements to entrances, lobbies and security. Construction Cost: $102 Millions

LIRR/MTA East Side Access Project, Metropolitan Transportation Authority (MTA), Bronx, New York The project involves the construction of new metro tunnels system in densely developed areas of Midtown Manhattan, new tunnels system construction beneath active Amtrak, Metro North and NYCTA facilities, construction of new terminals, ventilation facilities, off street entrances, and yards development. In addition to establishing the guidelines of the project specific environmental management system, he provided direct and extensive public and community relations outreach, educational and awareness programs, as well technical support for the design engineering and construction teams, inspectors, and environmental sub consultants, so that construction of the project proceeds in compliance with environmental commitments, be conducted under budget and on time, while maintaining the utmost quality. Another key component of the project success was the direct and constant coordination between the environmental department and the multiple agencies and operators/owners of the project, such as USEPA, NYSDEC, NYSDOH, NYCDOT, NYCDEP, NYCDOB, MTA, LIRR, NYCTA, Amtrak, and Metro North. Construction Cost: $8.4 Billion.

Hudson Yards, Proposed New York Jets Stadium, NY Jets, New York, NY (2005-2008) Served as the environmental project manager for the due diligence, investigation, and preliminary design phases of the proposed Jets Stadium. The work included subsurface investigation for soil, groundwater, and soil gas, and required close interaction with multiple entities including the MTA, LIRR, NYCTA, NYCDOS, NYSDEC, and Amtrak. Construction Cost: $1.4 Billion.

Columbia University Manhattanville Expansion Project, Columbia University, New York, New York Columbia University had a new campus built within a 17-acre area, which was comprised of academic and research facilities, housing, as well as commercial retail stores and open space areas. As the senior environmental project manager, he oversaw all environmental engineering related activities, including site assessment prior to the development, pre-construction support for demolition, recycling, soil and groundwater management, air quality controls, and LEED certification support. Construction Cost: $2+ Billion.

City University of New York, Tank Rehabilitation, Remediation and Closure Program, Dormitory Authority of the State of New York (DASNY), New York, New York (2005-2010) Served as the project manager for the technical assessment, remediation design, and oversight of the Underground

Storage Tank (UST) facilities at seven City University campuses. Tanks sizes ranged from 550 Gal to 50,000 Gal. The work included design drawings and construction documents for the tanks and dispensing systems for vapor recovery, fire suppression, electronic monitoring/sensing, pumping/delivery, storage tank details, site restoration, subsurface investigation, and spill remediation. Construction Cost: $5 Million.

FAA Technical Center, PCB Soil Remediation at Area 20A Superfund Site, United States Army Corps of Engineers (USACE), Atlantic City, New Jersey Served as a Laboratory Manager for the PCB contaminated soils removal project at FAA Technical Center. Responsibilities included the development of sampling and analysis plans, establishment of project data quality objectives, evaluation, and selection of laboratories for testing programs, data quality assessment, and reports preparation. Fees: $3.2 Million.

Potable Water System Testing for Lead, New York City School Construction Authority (NYCSCA), New York, New York Directly managed the emergency work for the sampling, testing, evaluation, and reporting of lead in the potable water of approximately 300 public schools in New York City. The project was conducted on a tight 24/7 timetable. The project was completed successfully under the direct supervision and daily coordination with the NYCSCA, with limited to no disturbance to schools' schedule and extracurricular activities, on time and on budget.

HydroTech Environmental
ENGINEERING AND GEOLOGY, DPC

Paul I. Matli, Ph.D., P.G.
VICE PRESIDENT

Ph.D., Environmental Sciences, Tokyo University of Agriculture and Technology, Japan, 2002

M.S., Environmental Sciences, International Center for Advanced Mediterranean Agronomic Studies, Greece, 1997

B.S. Agriculture Engineering, Saint Joseph University, Lebanon, 1994

Accredited US Educational Equivalence of Ph.D., M.S. and B.S. by Globe Language Services, Inc.

OSHA Certifications/Training

40-Hr HAZWOPER
8-Hr HAZWOPER Refresher
30-Hr Construction Safety and Health
10-Hr Construction Industry

Professional Licenses

New York State Professional Geologist (License # 000186)

Affiliations

Member of the American Institute of Professional Geologists since 2015 (Membership # 2784)

Summary of Experience

Mr. Matli has over twenty years of experience in environmental engineering and geology with established records of project portfolio management of remedial investigations, design and oversight of remedial cleanup and remedial closures at inactive hazardous waste disposal sites, Brownfield Cleanup Program (BCP) sites, Voluntary Cleanup Program (VCP) sites, Little-E designation sites, petroleum spill sites, former landfills and Superfund sites. Mr. Matli's extensive experience involves the preparation of Environmental Assessment Statements (EAS), Phase I Environmental Site Assessment (ESA) reports, Phase II Remedial Investigations Reports/Site Characterization Reports (RIR), Pilot and Feasibility Studies, Remedial Action Work Plans (RAWP), Construction Completion Reports (CCR), Site Management Plans (SMP) , Remedial Action Reports (RAR) and Final Engineering Reports (FER) for commercial and residential development complexes, auto related workshops, dry cleaners, manufacturing and industrial blocks. Mr. Matli has been in charge of providing technical guidance of all aspects of fieldwork including geophysical and sub-surface drilling activities for installing soil probes, monitoring wells, soil/sub-slab vapor implants, media monitoring and sampling, petroleum bulk storage tanks assessments as well as designing and installing vapor barriers, Sub-Slab Depressurization Systems (SSDS) and Soil Vapor Extraction (SVE) systems.

Relevant Experience

Brownfield Cleanup Program Remediation Of DNAPL Via *In-Situ* Chemical Oxidation/Bioremedial Agents And Active Vapor Mitigation Systems, Vleigh Place, Flushing, NY - Client: United Properties Corp. & VP Capital Holdings, LLC – As an Environmental Project Manager for this site, I was involved in the initial soil and groundwater assessments to investigate environmental impacts associated with the presence of an on-site drycleaner. These investigations confirmed on-site discharges of chlorinated solvents impacting thirteen storefronts located on-site. The former owner expressed interest in the New York State Department of Environmental Conservation (NYSDEC) BCP and I worked with this owner to apply to the program as a Participant. I then prepared and coordinated all necessary documents for the transition of this site into the BCP. Under BCP, I performed additional subsurface delineation of soil and groundwater impact as well as the extent of vapor intrusion impacts on-site and off-site. Besides a I conducted receptor survey that confirmed the presence of a significant threat to the health of 13 commercial tenant located on-site and occupant of two adjacent residential complexes. Immediate remedial activities were required on-site and off-site. As environmental engineer I was involved the design and

site tenant spaces prior to their destruction by a fire in 2016. I was then involved in the design and installation of an interim Soil Vapor Extraction (SVE) system to prevent the migration of chlorinated vapor into adjacent residential buildings. Under the directions of an NYS Licensed Professional Engineer (PE), I had the direct responsibility of preparing and implementing a NYSDEC-approved RAWP. RAWP activities consisted of a site-wide soil excavation, multiple rounds of in-situ groundwater treatment by chemical oxidation brand name PersulfOx and a bioremedial agent brand name 3_D Microemulsion Factory Elumlsified (3DME) followed by several rounds of post-groundwater remediation sampling events. A total of 48,830 cubic yards of non-hazardous fill material and a total of 1,080 cubic yards of former concrete foundations were also removed during site excavation for future redevelopment. In addition, monitoring of soil vapor intrusion has also been performed off-site in surrounding sidewalks and adjacent buildings including a daycare facility. The Site remediation was completed by achieving the Unrestricted Soil Cleanup Objectives for the soil cleanup and the Track 4 Cleanup Goal for the Site. Using an innovative and affordable remedial design, I was able to stay within budget, prepare an SMP and an FER and help my client receive the tangible tax credits by completing the BCP milestones and receive a NYSDEC-issued Certificate of Completion (COC) within two years of NYSDEC RAWP approval. The site is currently under a post-remediation Site Management Plan, which includes a groundwater sampling program, SVE monitoring program, an SSDS installation and monitoring at adjacent property (2014 - Ongoing).

Brownfield Cleanup Program Remediation Of Historic Railroad Freight Yard And Manufacturing Site, East 135th Street, Bronx NY – Client Deegan 125th Realty LLC – Project Site involved the redevelopment of a 1.112-acre site into two 25-story mixed residential and commercial use towers with full basements and parking/driveways over of two unexcavated public utility easements. With the active involvement of HydroTech, the Site was initially enrolled for remediation under the NYC Mayor's Office of Environmental Remediation (OER) VCP program. With its location in the En-Zone along with the presence of soil impacts from historic uses, I identified this Site as an opportunity for the NYSDEC BCP and I worked with the developer to apply to the program as a volunteer. Once the site was accepted into the BCP program, I performed a Focused Site Characterization and prepared a NYS Licensed PE – certified RAWP with a Track 1 Cleanup Goal. During remedial excavation into the interim unsaturated soil, residual soil contamination could not be removed over 63.6% of the Site perimeter and as such, Track 1 Cleanup Goal was achieved over 0.0405 acres and Track 4 cleanup was achieved over 0.707 acres. As the project manager and project geologist, I provided all necessary support during Site remediation including but not limited to obtaining a Quality and Quantity Dewatering Permit from NYCDEP, perform soil waste characterization and coordinate approvals by soil disposal facilities of 36,048 tons of non-hazardous soil disposed of this project, and also coordinate regulatory approvals of 7,680 tons of required backfill material imported to the site. At the completion of the remedial development, I prepared and submitted to NYSDEC an SMP and a NYS Licensed PE – certified FER. NYSDEC-issued a COC within 30 months of NYSDEC RAWP approval. The site is currently under the post-remediation site management inspection and reporting of a composite cover (2015 – Present).

Management Of Cleanup Of Hazardous Materials At A Former Rubber And Adhesives Factory, 9th Street, Long Island City, NY – Client 9th Street LIC – This project site was historically used for adhesives manufacturing for approximately 62 years and a site environmental characterization identified the presence of hazardous chemical waste beneath the property. After thirteen years of no response by former ownership to address site remediation pursuant to a NYSDEC consent order, a new ownership became involved as a respondent to the Consent order and has requested HydroTech to expedite a design for a site cleanup that should be completed within less than 3 months during the layout of a new building foundations. As a Project Manager, I prepared a NYS licensed PE-certified Interim Remedial

Measures Work Plan (IRM WP), which underwent within less than 3 months four revisions due to evolving site information related to underlying bedrock and perched water. The IRM WP included specific soil cleanup methods and selected remedies dictated by NYSDEC that included a design for an SVE system and subsequently a SSDS. IRM activities completed during a first phase included a further delineation of hazardous contamination in soil across the site, groundwater sampling for emerging contaminants and volatile organic compounds, soil waste characterization, acquisition of a dozen Contained-in Determination letters from NYSDEC for non-hazardous waste, proper disposal of 1,123.24 tons of hazardous soil and 5,362.54 of non-hazardous soil, disposal of 45,371 gallons of non -hazardous liquid from dewatering and truck wash/decontamination pad, closure and removal of 9 underground storage tanks (USTs) listed in the Petroleum Bulk Storage (PBS) database and Chemical Bulk Storage database. My project oversight included monitoring day-to-day construction operations by directing a field crew consisting of a geologist, a community air monitoring technician and a technician for odor suppression. The second phase of IRM activities were upgraded consistent with site development. These activities were detailed in an NYSDEC-approved IRM WP Addendum and will resume upon completion of building construction (2019 – Present).

Remedial Development And Spill Closure At A Gasoline Station, 11th Avenue, New York, NY – Client: Sam Ruv Operating Corp. – This project involved remedial redevelopment activities at a former gasoline filling station and an auto repair facility into a 10-story commercial building. My duties as a Qualified Environmental Professional (QEP) included the performance of a remedial investigation addressing a Little E-Designation for hazardous materials. The investigation was conducted per a NYCOER Remedial Investigation Work Plan. In-situ petroleum releases identified during this investigation lead to the opening of an NYSDEC petroleum spill case. I prepared a Remedial Action Work Plan which included a design for a waterproofing vapor barrier under the directions of a NYS Licensed PE and oversaw the implementation of remedial activities in coordination with OER as part of a Voluntary Clean-Up Program (VCP) and under the authority of NYSDEC as part of spill remediation. During site remediation, non-hazardous petroleum contaminated soil/fill was excavated and removed from the property pursuant to a soil Waste characterization exercise, which I conducted, beforehand. In addition, gasoline and diesel underground storage tanks were properly closed and removed from the properly in compliance with applicable laws and regulations. As part of site development, the vapor barrier system that consisted of a waterproofing membrane was installed beneath the hydrostatic slab across the footprint of the building. At the completion site remediation, a decision for a No Further Action was issued by NYSDEC for the spill incident and achieved a Track 1 Cleanup Goal was achieved under which condition, the Little E-Designation for hazardous materials was removed to the Satisfaction of the NYCOER (2015 - 2018).

Integrated Remedial Options For Mixed Use Site Redevelopment And Management, Canal Street, New York, NY – Client: CBCS Hudson Equities, LLC – As an Environmental Project Manager for this Site, I assisted a NYS Licensed PE during the preparation of RAWPs addressing the remediation of an NYSDEC petroleum spill case in accordance to NYSDEC requirements and also a Little E-designation for hazardous materials in accordance with NYCOER guidance and approvals. I designed, coordinated and directed the performance of remedial activities during site development into a 10-stroy hotel. The scope of these activities consisted of the performance of a soil waste characterization, *in-situ* groundwater treatment by Chemical Oxidation brand name RegenOx™ and bioremedial agent identified as Oxygen Releasing Compounds Advanced (ORCA), the proper closure and removal of a waste oil and gasoline USTs, soil waste characterization, excavation of impact fill material and petroleum impacted soil to below the depth of soil groundwater interface and disposal of non-hazardous regulated waste, collection and analysis of post-excavation endpoint sample, application of Oxygen Releasing Compound Advanced (ORCA) pellets at bottom of excavation, the installation of an active SSDS and a waterproofing vapor barrier and the institution of a groundwater monitoring and sampling program leading to the final closure of NYSDEC spill case. Performed annual inspection of installed engineering controls consisting of

vapor barrier, SSDS and concrete slab to monitor their environmental function for the protection of the health of building occupants pursuant to an OER-approved Site Management Plan (SMP) (2010 - Ongoing).

Petroleum Spill Remediation And Soil Vapor Mitigation At A Former Gasoline Station, Cropsey Avenue, Brooklyn, NY – Client: Avo Construction – The project site is a former gasoline station and auto repair facility associated with an NYSDEC gasoline-related spill case. This site was then redeveloped into seven 3-story residential buildings. As a project geologist I managed the entire remediation of residual gasoline constituents in soil and groundwater beneath the new vacant building and the mitigation of gasoline vapors detected in the basement and first floor at this development. The mitigation of gasoline vapors were undertaken following a regulatory order issued by the New York State Department of Health (NYSDOH) through the NYSDEC and the New York City Department of Health (NYCDOH) preventing this site from being occupied before taking the necessary measures to render it protective to human health. I designed and installed individual active SSDS in each of the seven 3-story vacant residential buildings following a quantitative pre-mitigation diagnostic testing exercise, which I performed pursuant to NYSDEC and NYSDOH approvals. The seven SSDSs were adequately designed to eliminate the potential vapor intrusion pathway between the vapor source (soil and groundwater) and the receptor (indoor air within the building interior). Upon verifying the SSDS successfully prevented the sub-slab gasoline vapors from impacting the indoor air, the NYSDEC in consultation with NYSDOH and NYCDOH authorized the occupation of the seven new developments at this site. The remediation of gasoline constituents in soil and groundwater was then performed following a complete delineation of contamination on-site and off-site. This remediation involved three rounds of off-site groundwater treatment by RegenOx™ and also ORCA. Upon reducing the levels of contaminants to levels satisfactory to NYSDDEC, a decision for a No Further Action was issued by NYSDEC for the spill incident (2010 - 2017).

Site Cleanup For Affordable Residential Redevelopment, Third Avenue, Bronx, NY – Client : Strategic Development & Construction Group – This project consisted of a remedial development of a new 7-story low income/supportive housing residential building with a full cellar located on the west side of Third Avenue in the Morrisania Section of the Bronx that is mostly a low income residential neighborhood. The new building is owned and operated by Services for the UnderServed (SUS), a non-profit agency that provides housing and support services for formerly homeless and other qualified residents. As an Environmental Project Manager for this Site I had to complete several project milestones leading to the finishing of this remedial development. These project milestones included the preparation of an Environmental Assessment Statement (EAS) and Environmental Assessment (EA) to obtain funding from the U.S. Department of Housing and Urban Development's (HUD) HOME Investment Partnership Program (HOME) funding through HPD's Supportive Housing Loan Program. My duties also involved fulfilling the remedial requirements of a Little E-designation for hazardous materials in accordance with City Environmental Quality Review (CEQR) requirements and a NYCOER-approved RAWP pursuant to the NYC VCP. The implementation of RAWP during building construction lead to the identification of hazardous levels of lead in 60 percent of the site soil/fill material through soil waste characterization investigation and several delineation investigations. The project disposed of 2,474.4 tons of hazardous lead contaminated soil. The remedial goal of a Track 1 cleanup was achieved following site cleanup. I was the recipient for the 2016 Big Apple Brownfield Award for Supportive/ Affordable Housing issued for this project by the New York City Brownfield Partnership (2013 - 2015).

Landfill Remedial Monitoring, Paerdegat Basin Natural Area Park, Brooklyn, NY – Client : New York City Department of Environmental Protection (NYCDEP) – This project is an artificially created basin out of Bedford Creek, a freshwater tributary to Jamaica Bay. The basin was impacted by conveying street runoff directly from stormwater and combined sewer overflows from highly urbanized neighborhood and also by dredging conducted during the early twentieth century and historic fill in the South Natural Park Area. Approximately, 177 acres of Paerdegat Basin shoreline and submerged land were restored to

parkland including a Natural Area Park and Ecology Park. In order to correct the degraded water quality conditions in Paerdegat Basin, groundwater sampling was performed to evaluate whether the designated contaminants identified by prior investigations within the urban fill material of the South Natural Park Area have potentially impacted the groundwater after the construction of the Natural Area Park and Ecology Park. As an Environmental Geologist for this site, I performed groundwater sampling per Investigation Work Plans, which I prepared and were approved by NYSDEC and NYCDEP. Groundwater investigations were performed once at pre-construction and several time at post-construction at the Natural Area Park and Ecology Park. These groundwater investigations involved the installation and development of monitoring wells, the sampling of monitoring wells per USEPA low flow samling methods and the sampling of surface water during periods of low tides and high tides with specially designated Quality Assurance Project Plans. I documented the findings of these investigations in groundwater investigation reports to the satisfaction of NYCDEP and NYSDEC (2014 - 2016)

Industrial Air Quality Assessment For Office Conversion Into A Daycare Facility, 40th Avenue, Queens, NY - Client: Peachy Enterprise, LLC - This project addressed the CEQR Technical Manual – Chapter 17 provisions for hazardous materials associated with suspect on-site and off-site historic uses and also an air quality impact assessment in anticipation of the conversion of an office space to a day care center within an existing office building located in M1-3 manufacturing zone under a special permit from the New York City Board of Standards and Appeals (BSA). As an Environmental Project Manager for this site, I performed a Hazardous materials investigation in accordance to NYCDEP-approved investigation work plan, which I prepared. I also prepared a NYCDEP-approved RAP, which was certified by a NYS Licensed PE. I also prepared an air quality impact assessment to the satisfaction of NYCDEP and this assessment involved a boiler screen analysis per CEQR guidance as well as a basic screening of industrial mobile and stationary sources using EPA's AERSCREEN screening dispersion models and detailed analysis using EPA's AERMODE dispersion model. Findings of air emissions provided by these models were compared to NYSDEC's Guidelines for the Evaluation and Control of Ambient Air Contaminants under 6 NYCRR Part 212 Process Operations DAR-1 Annual Guideline Concentrations (AGC) and Short-Term Guideline Concentrations (SGC) Tables Guidance documents. Upon verification that air pollutant concentrations are below the impact criteria, NYCDEP issued a sign-off on the submitted air quality impact assessment documents and back-up materials and issued a notice to proceed for the establishment of the day care facility (2013 - 2014).

HydroTech Environmental
ENGINEERING AND GEOLOGY, DPC

MARIE ROSE FARAH

Junior Project Manager/ Professional

Ms. Farah serves as a Junior Project Manager, supporting environmental due diligence and remediation projects for private and public sector clients across New York and New Jersey. Her work involves conducting Phase I and II Environmental Site Assessments (ESAs), assisting in the preparation of Remedial Investigation (RI) and Remedial Action Work Plan (RAWP) reports, and providing technical and field support during implementation. She assists in the oversight of remedial activities, coordinating with field crews and subcontractors to ensure work is performed in accordance with project specifications and health and safety requirements. Ms. Farah works under the direction of a Senior Project Manager, contributing to project documentation, data evaluation, and preparation of reports submitted to regulatory agencies such as NYSDEC, NYCDEP, and NYC OER.

PROJECTS

Environmental Impact Assessments, Phase I ESAs, and Phase II ESIs, Jersey and New York Region – Clients: Amazon, Whole Foods (2023-2025). The projects involved conducting environmental due diligence and remediation assessments for multiple commercial and industrial redevelopment properties across the Jersey and New York region. As the environmental consultant on these projects, she performed Phase I and Phase II Environmental Site Assessments (ESAs) for Amazon, Whole Foods to identify Recognized Environmental Conditions (RECs) and evaluate potential contamination. The work included site reconnaissance, soil and groundwater sampling, and interpretation of analytical results to assess environmental risk and guide redevelopment planning. She coordinated field activities with laboratories and subcontractors, ensured compliance with NJDEP, NYSDEC and EPA regulations, and prepared detailed technical reports summarizing findings and recommendations.

Mixed-Use Redevelopment Sites (Three Lots), Bronx, NY – Client:4123 Third Ave LLC.(2024-Present) The project involved the redevelopment of three adjoining lots in the Bronx under the supervision of the New York City Office of Environmental Remediation (OER) as part of an approved remedial action program. As the environmental engineer on the project with HydroTech Engineering and Environmental Services, she has been involved from the initial design phase, supporting the preparation of the Remedial Action Work Plan (RAWP) and associated technical documentation submitted to OER for approva l under the supervision of a professional Engineer. Her work included developing the remedial approach, identifying

SPECIAL COMPETENCIES

Environmental Management & Inspection
Remedial Design
Oversight for City and State Brownfield Cleanup Projects
Permitting

TOTAL YEARS OF EXPERIENCE

5

EDUCATION

Degree

M.Eng., Master of Engineering in Environmental Engineering, Cornell University, NY,2023

B.E., bachelor's in Civil and Environmental engineering, Notre Dame University, Beirut, Lebanon,2018

CERTIFICATIONS/TRAINING

OSHA: 40 Hour HAZWOPER
OSHA 10 Hour Construction Safety and Health
OSHA 30 Hour for Construction Industry

Appendix J

Request to Import/Reuse Fill Material

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e) and 6NYCRR Part 360.13. Use of this form is not a substitute for reading the applicable regulations and Technical Guidance document.

SECTION 1 – SITE BACKGROUND

The allowable site use is: Choose an item

Have Ecological Resources been identified? Choose an item

Is this soil originating from the site? Choose an item

How many cubic yards of soil will be imported/reused? Choose an item

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone? Choose an item

Does it contain less than 10%, by weight, material that passes a size 100 sieve? Choose an item

Is this virgin material from a permitted mine or quarry? Choose an item

Is this material recycled concrete or brick from a DEC registered processing facility? Choose an item

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

_____ _____

Signature Date

_____

Print Name

_____

Firm

Revised April 2023

Appendix K

Bioremedial Agent Calculation and Manufacturer's Documentation

PROJECT SUMMARY

REGENESIS is pleased to present Hydro Tech Environmental with a budgetary remedial design and cost range estimate for the 3038 Webster Ave project. This budgetary proposal is intended for evaluation and planning purposes. We look forward to providing a comprehensive, detailed proposal once you have reviewed this information and confirmed that our approach aligns with your remedial goals.

Project Drivers and Goals

The subject site, located at 3038 Webster Ave, Bronx, NY, is impacted by petroleum hydrocarbons (PHCs) around MW-4a and MW-7 in the dissolved phase.

Proposed Solution

The proposed in situ treatment strategy relies on enhanced aerobic biodegradation using ORC Advanced® (ORC-A) to provide sustained aerobic biodegradation of dissolved-phase hydrocarbons.

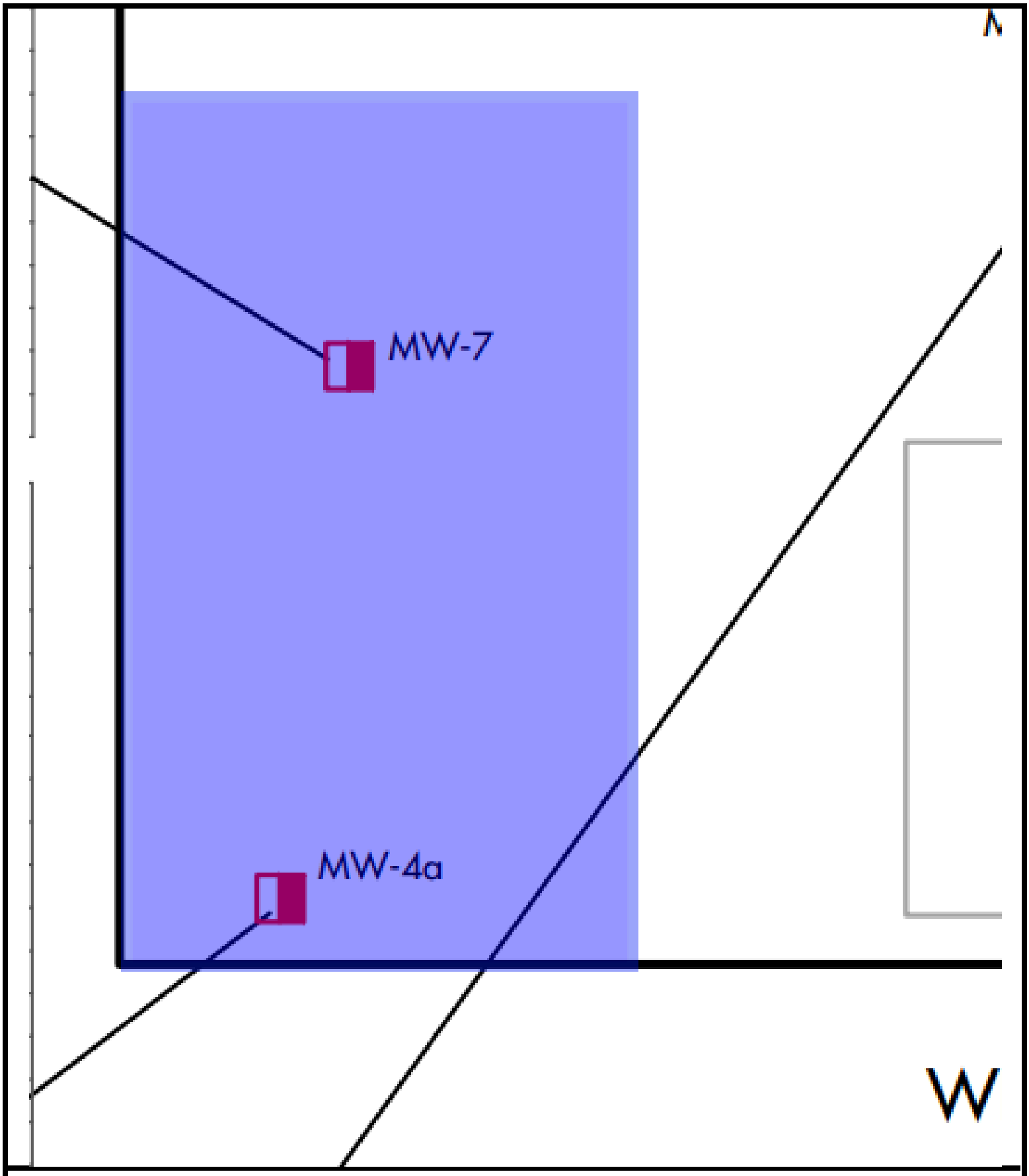
The proposed approach addresses key project drivers:

- **Sustained Oxygen Supply.** Its controlled-release formulation provides a long-term oxygen source (~12 months), reducing the need for frequent reapplications or rapid release and waste of oxygen.
- **Cost Effective Application.** ORC-A is very easy to mix and inject compared to other remediation projects, requiring low injection volumes and a minimized chance for surfacing. Quickly injected where needed in any soil type.
- **Minimal Site Disruption.** With straightforward application methods (e.g., direct-push or injection wells), remedial activities can proceed without major interruption to site operations.

ORC-A is advanced in the subsurface by direct push and applied throughout the saturated and smear zones.

Key Assumptions

- The treatment area is currently under anoxic conditions.
- The treatment area contains an environment suitable for bioremediation, including a neutral pH and moderate groundwater temperatures.
- Treatment is limited to MW-4a and MW-7.
- There is not on going contamination source.
- There is no NAPL or significant soil mass near the treatment area.



3038 Webster Ave
Hydro Tech Environmental
March 27, 2026

Figure 1-Treatment Area Map

REGENESIS®

Detailed Design Tables

Project Info		
3038 Webster Ave Bronx, NY		
Target Treatment Zone (TTZ) Info	Unit	Value
Treatment Area	ft^2	1,125
Top Treatment Depth	ft	22.0
Bottom Treatment Depth	ft	34.0
Vertical Treatment Interval	ft	12.0
Treatment Zone Volume	ft^3	13,500
Treatment Zone Volume	cy	500
Soil Type	---	Weathered Bedrock
Porosity	cm^3/cm^3	0.30
Effective Porosity	cm^3/cm^3	0.25
Application Design Summary		
Application Method	-	**Direct Push**
Spacing Within Rows	ft	10.0
Spacing Between Rows	ft	10.0
Application Points	-	**11**
ORC Advanced to be Applied	lbs	**960**
ORC Advanced per point	lbs	87.3
Percent Slurry	%	**30%**
Volume Water	gals	**268.4**
Volume ORC Advanced	gals	43.2
Total Application Volume	**gals**	**311.6**
Application Volume per Foot	gal/ft	2.36
Injection Volume per Point	gals	28.3

Recommended ORC-A Monitoring Parameters

Regenesis recommends collecting baseline samples for all recommended monitoring parameters before injection. Be sure to review state-specific Underground Injection Control (UIC) guidelines for any additional required parameters not listed in this table.

Analytical Parameter	Methodology/Notes
Contaminants of Concern (COCs)	Site-specific; typically includes BTEX compounds, Total Petroleum Hydrocarbons (TPH), etc.
Dissolved Oxygen (DO)	Meter reading taken in a flow-through cell.
Oxidation-Reduction Potential (ORP)	Meter reading taken in a flow-through cell.
pH	Meter reading taken in a flow-through cell.
Electrical Conductivity (EC)	Meter reading taken in a flow-through cell.
Dissolved Iron (Fe^{2+}) and Manganese (Mn^{2+})	Filtered and acidified in the field; analyzed using appropriate EPA methods.

Application Instructions and Other Information

See the technology overview and resource section at the end of this proposal.

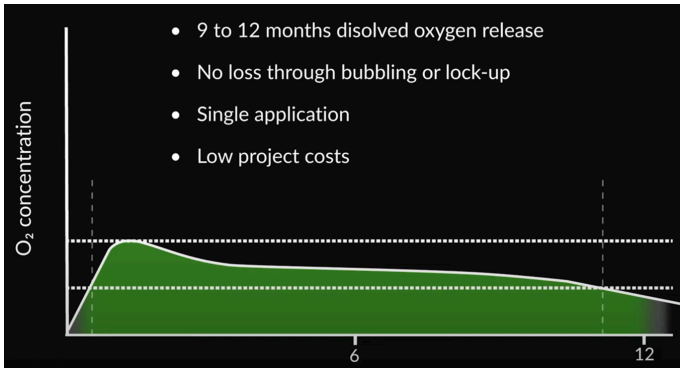
ORC Advanced® (ORC-A) Technical Overview

ORC-A is a state-of-the-art in situ oxygen release technology to stimulate aerobic bioremediation of contaminated groundwater and soil. It is a formulation of calcium peroxide with Controlled Release Technology™, allowing for sustained oxygen release over time.

Features and Benefits of ORC Advanced

- **Controlled Release Technology:** Commodity calcium peroxide releases oxygen rapidly and then experiences "lock-up" from hydroxide rind formation. ORC-A employs intercalated phosphate technology to maintain steady, controlled oxygen release over 12 months. This avoids the "blow-off" associated with commodity products followed by "lock-up." ORC-A provided a more even release of its 17% by weight oxygen.
- **Broad Contaminant Applicability:** Aerobic biostimulation is effective for BTEX, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAHs), methyl tert-butyl ether (MTBE), and chlorinated solvents like vinyl chloride (VC) and dichloroethene (DCE).
- **Operational Simplicity:** ORC-A is easily applied as a dry powder or slurry, supporting flexible site application methods, including direct injection, excavations, and permeable reactive barriers (PRBs). It is safe around infrastructure and easily paired with other forms of remediation as a polish (e.g., post-chemical oxidation polishing).

Hyperlinked ORC-A YouTube Overview



ORC-A Resources

Media:

- **ORC-A Case Studies**: Over 90 case studies showing performance in varied conditions. Use search or pull-downs on this weblink to identify case studies of interest.

Product Literature:

- **ORC-A Spec Sheet:** Summary of specifications and properties of the PetroFix®,

Application Instructions:

- **ORC-A Application Instructions**: Instructions for using direct push injection equipment.
- **Oxygen Release Compound® (ORC) Installation Instructions: Excavation Applications:** Instructions for applying PetroFix within excavation sites.
- **ORC-A Socks Installation Instructions:** Procedures for administering ORC-A Socks.
- **ORC Installation Instructions: Geoprobe® Bore-Hole Back-Fill Method**: Instructions for backfilling augured boreholes with ORC-A.

Safety Data Sheets:

- **ORC-A SDS**: SDS for powdered ORC-A.
- **ORC-A Pellets SDS**: SDS Sheet for pellet formulated ORC-A.

Appendix L

SSDS Design Specifications and Material Specifications Cut Sheets

GAST MANUFACTURING, INC.
A Unit of IDEX Corporation
Post Office Box 97
Benton Harbor, Michigan
Ph: 269/926-6171
Fax: 269/925-8288

Product Specifications

PART NUMBER: LTD177

REV. F

MODEL NUMBER	MOTOR SPECIFICATIONS	RPM	MAX VAC		MAX PRESS		HP	kW	NET WT.	
			"H_2O	mbar	"H_2O	mbar			lbs.	kg
R4310P-50	208-230/460-60-3	3450	48	120	51	127	1.0	0,75	58	27
	220/380-50-3	2850	35	87	38	95	0.6	0,45		

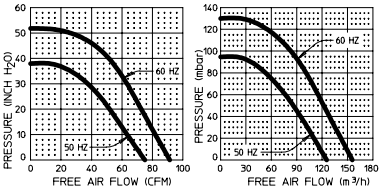
SOUND LEVEL 68/64 dB(A) MAX. @ 60/50 Hz
NORMAL AMBIENT -29°C TO 40°C
RELATIVE HUMIDITY 0% - 100% NON CONDENSING
ENVIRONMENT CLEAN DUST FREE

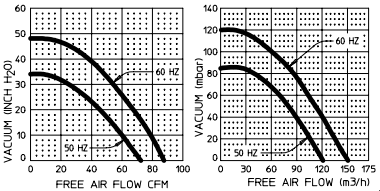
UL AND CSA APPROVED MOTOR FOR EXPLOSIVE GAS ATMOSPHERES CLASS 1, GROUP D, CLASS 2, GROUP F AND G.

THIS BLOWER IS DESIGNED FOR SOIL AND GROUND WATER REMEDIATION.

TECHNICAL DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Product Performance





PERFORMANCE DATA
THE PERFORMANCE DATA SHOWN WAS DETERMINED UNDER THE FOLLOWING CONDITIONS:

LINE VOLTAGE @ 60 Hz. 230V OR 460V FOR 3 PHASE UNITS. 115V OR 230V FOR 1 PHASE UNITS.

LINE VOLTAGE @ 50 Hz. 220V FOR 3 PHASE OR 1 PHASE UNITS.

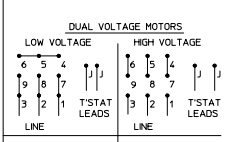
UNITS IN A TEMPERATURE STABLE CONDITION.

DELIVERY MEASUREMENTS MADE WITH OUTPUT PORT THROTTLED.

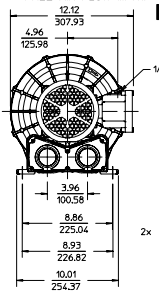
SUCTION MEASUREMENTS MADE WITH INPUT PORT THROTTLED.

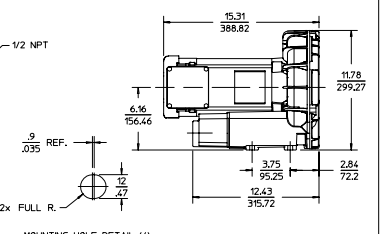
TEST CONDITIONS: INLET AIR DENSITY @ 0.075 lbs. per cu. ft. [20°C (68°F), 29.92" Hg (14.7 PSIA)].

NORMAL PERFORMANCE VARIATIONS ON THE RISISTANCE CURVE WITHIN ±10% OF SUPPLIED DATA CAN BE EXPECTED.



Product Dimensions mm/inches



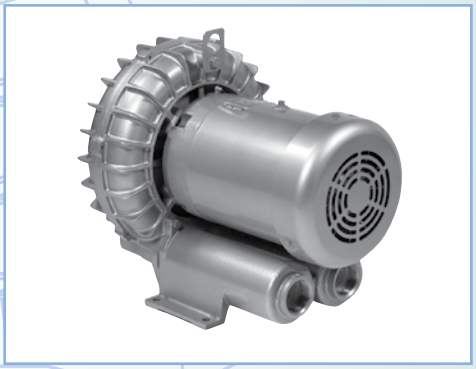


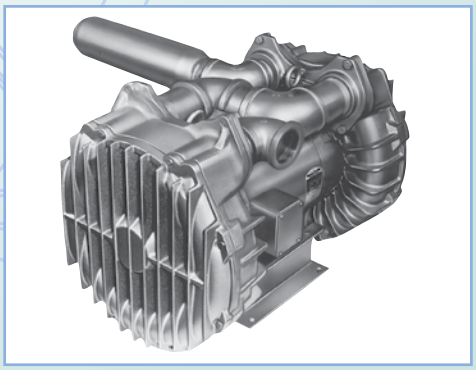
MOUNTING HOLE DETAIL (4)

GAST

Regenair®

Regenerative Blowers





The Gast Group **Difference**

For over 90 years, Gast Manufacturing has been providing innovative air solutions to a broad breadth of customers. With the relatively recent addition of JUN-AIR, we have expanded our capabilities and formed, "The Gast Group." Together, our diverse engineering background and pneumatic experience allow us to provide both component and system solutions to meet all of your pneumatic needs...all backed by our strong commitment to quality and customer support.

Products for Almost Any Application – Worldwide

We offer an extensive and versatile line of air-moving products, including vacuum pumps, compressors, air motors, gearmotors, vacuum generators, and regenerative blowers. We design and build these components for original equipment manufacturers worldwide, but we also develop complete pneumatic solutions to solve tough customer challenges.

To ensure fast, efficient delivery of products, Gast has a vast network of sales representatives/distributors throughout the United States and the world. Plus, we maintain direct sales and service facilities in Europe, Hong Kong, and Shanghai, China.

Unparalleled Design Expertise

Unlike other manufacturers, who might expect you to modify your pneumatic system to fit their available product(s), Gast is committed to finding the right product to meet your specific needs. If we don't have a high-quality, off-the-shelf product to fit your existing application or meet your anticipated needs, we'll propose customized cost-effective design options that will serve your special requirements. We can even develop and produce your complete pneumatic system for you.

Our experienced Research and Development engineers and Product engineers work together to analyze customer needs and use computer-aided design to generate timely solutions for air-handling problems. The design team has one goal: to create problem-solving solutions that capitalize on the latest available technology, meet all application requirements, and benefit from cost-effective production methods. The end result: products and solutions that are the best value in the marketplace for our customers.

A Lasting Commitment to Quality

We invest heavily in both equipment and people to maintain the consistent quality for which our products are known worldwide, and we have done so since day one. As early as 1983, we implemented a total quality process designed to ensure the quality of our products. In keeping with that tradition, Gast has achieved ISO 9001 certification, making us a member of the elite group of manufacturing companies in the world to receive that certification.

European Community Directives CE

With extensive sales outside the United States, Gast has pledged to conform to the European Community Directives. These directives contain essential requirements concerning health, safety, environment, and consumer protection for all products targeted for the European Community market. Currently, all Gast products available for sale in the European Community are in compliance with the Machinery, Low Voltage, and Electromagnetic Compatibility Directives.

Pictorial and dimensional data is subject to change without notice. The information presented is based on technical data and test results of nominal units. It is believed to be accurate and is offered as an aid in the selection of Gast products. It is the user's responsibility to determine suitability of the product for intended use and the user assumes all risk and liability whatsoever in connection therewith. Environmental and application conditions may affect advertised life.

Why use a Regenair® Regenerative Blower?

Features and Benefits

Standard Motor Mounted Models

- Rugged construction of cast aluminum or cast iron, depending on model size
- UL and CSA approved motors; TEFC on single-ended models, OPEN on dual-ended models. Permanently sealed ball bearings incorporate new polyurea grease that extends bearing life and offers superior resistance to washout, rust, and corrosion. Integrated mufflers on single-ended models minimize operating noise

Explosion-Proof Motor Series

- UL and CSA approved explosion-proof multi-voltage motors with thermal protection
- Double sealed ball bearings with a B10 life exceeding 30,000 hours of continuous operation at the maximum rated continuous blower load
- Sealed air streams; leak tested to less than 5 cc/min

Separate Drive Series

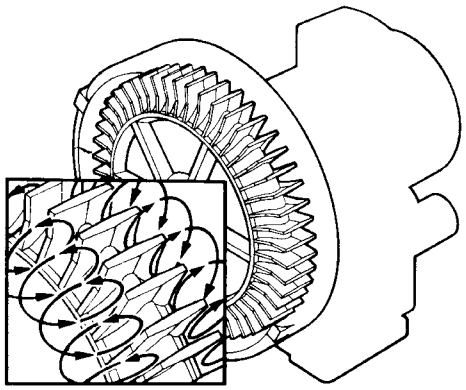
- Drive pulley size can be changed to lower speeds and adjust performance
- Built-in acoustical muffling reduces operation noise
- Precision balanced impellers provide low vibration operation

The Regenerative Principle

In a regenerative blower, the compression space consists of a hollow, circular ring between the tips of the impeller blades and the walls of the housing. In operation, the rotating impeller draws in air from the inlet port into the compression space and moves it radially outward to the curved housing by centrifugal force.

The action is called “regenerative” because a certain amount of air slips past each impeller blade during rotation and returns to the base of a succeeding blade for reacceleration.

Because of this dynamic principle, regenerative blowers can generate pressure and vacuum performance comparable to many multi-stage or positive displacement blowers.



Regenair® Regenerative Blowers Performance Overview

MODEL/ SERIES	POWER RATING @ 60 Hz HP	kW	FREE AIR FLOW CFM 50 Hz	60 Hz	M³/h 50 Hz	60 Hz	MAXIMUM PRESSURE inH_2O 50 Hz	60 Hz	mbar 50 Hz	60 Hz	MAXIMUM VACUUM inH_2O 50 Hz	60 Hz	mbar 50 Hz	60 Hz
Standard Motor Mounted Models														
R1*	1/8	0,09	23	27	39	46	21	28.5	52	71	20	26.5	50	66
R2*	1/3, 1/2	0,25, 0,37	33	42	56	71	30	39	75	97	25	35	62	87
R3*	1/2	0,37	43-44	52-53	73-75	88-90	31-40	43-55	77-100	107-137	28-35	40-50	70-87	100-125
R4*	1	0,75	75	92	127	156	38	52	95	130	35	48	87	120
R4P*	1 1/2	1,1	110	127	187	216	50	65	125	162	45	60	112	149
R5*	2 1/2	1,86	133	160	226	272	50	65	125	162	47	60	117	149
R6*	2 1/2- 5	1,86- 3,73	180	207- 215	306	352- 365	40- 78	45- 105	100- 194	112- 262	50- 70	55- 88	125- 194	137- 262
R6P*	3 1/2- 5 1/2	2,6- 4,1	225- 245	265- 290	382- 416	450- 493	50- 85	30- 110	125- 212	75- 274	50- 85	35- 90	126- 212	87- 224
R6PP*	11	8,2	420	520	714	884	75	95	187	237	65	80	162	199
R7*	10	7,46	350	420	595	714	115	125	286	311	90	110	224	274
R7P*	18	13,4	666	795	1132	1351	90	105	284	262	85	95	212	237
R9*	15	11,3	585	680	994	1155	125	125	311	311	105	115	262	286
R9P*	30	22,4	1140	1350	1937	2294	110	125	274	311	100	110	249	274
High Pressure Motor Mounted Models														
R4H*	6	4,5	107	128	182	217	284	284	707	707	183	183	456	456
R6PS*	11	8,2	230	280	391	476	145	170	361	423	110	130	274	324
R7S*	18	13,4	350	420	595	714	170	200	423	498	130	150	324	374
R9S*	30	22,4	585	660	994	1121	208	222	518	553	142	149	354	371
Explosion Proof Motor Models														
R3105N-50	1/2	0,37	44	53	75	90	31	43	77	107	28	40	70	100
R4110N-50	1	0,75	74	92	126	156	38	51	95	127	35	48	87	120
R4310P-50	1	0,75	74	92	126	156	38	51	95	127	35	48	87	120
R4P115N-50	1 1/2	1,1	112	133	190	226	45	65	112	162	40	60	100	149
R5125Q-50	2	1,5	—	160	—	272	—	55	—	137	—	60	—	149
R5325R-50	2	1,5	133	160	226	272	50	65	125	162	47	65	117	162
R6130Q-50	3	2,2	180	215	306	365	75	60	187	149	65	70	162	174
R6340R-50	4	3,0	180	215	306	365	75	100	187	249	65	80	162	199
R6P155Q-50	5 1/2	4,1	235	280	399	476	80	95	199	237	65	85	162	212
R6P355R-50	6	4,5	232	280	394	476	80	100	199	249	65	85	162	212
R7100R-50	10	7,5	350	425	595	722	90	100	224	249	85	110	212	274
Separate Drive Models														
SDR4	4	3,0	147		250		110		274		90		224	
SDR5	10	7,5	240		408		152		379		120		299	
SDR6	15	11,2	300		510		155		386		135		336	

*Models equipped with UL and CSA certified motors. (except R1102K (12v DC))

Catalog Performance Specifications

The specifications listed are that of a unit at sea level with an ambient temperature of 70 °F (21 °C), operating with normal electrical current conditions. The figures stated in this catalog are nominal approximations for models without accessories. Intake filters and exhaust mufflers, and the accumulation of contaminants in them during operation, will decrease the flow of air as well as the achievable pressure.

The units that we list in this catalog are a small portion of what we actually make. Those listed are considered “standard units” and are normally available from stock in small quantities. Variations are produced for many customers and by informing us of the application specifications we might find an existing unit that fits your requirement. If we don’t and the quantity is sufficient, we will design a “special unit” for the application.

Pictorial and dimensional data is subject to change without notice.

The information presented in this catalog is based on technical data and test results of nominal units. It is believed to be accurate and is offered as an aid in the selection of Gast products. It is the user’s responsibility to determine suitability of the product for intended use and the user assumes all risk and liability whatsoever in connection therewith.

Blower System **Design Tips**

In order to utilize your regenerative blower most efficiently, proper system design is essential. The most important thing to recognize is that by utilizing large diameter plumbing, friction losses in plumbing can be greatly reduced. Here are some guidelines to use when setting up your blower system:

1. The plumbing should at least be the same size as the blower port or ideally one size larger (example - blower has ports that are 1-1/2" NPT, plumbing should be 2" NPT). The plumbing should remain this size until it has reached the location of the work area.
2. Plumbing for Separate Drive Blowers operating above 3500 RPM should be at least one pipe size larger than the blower ports.
3. Elbows create additional friction which causes pressure loss and back pressure. Plumbing at least one pipe size larger than the blower pipe ports minimizes the friction loss they create.
4. The pressure/vacuum relief valve should be installed in a "T" which is at least one pipe size larger than that of the exhaust of the blower. To properly protect a large horsepower blower, set the relief value to limit the blowers duty to 5 inH_2O below its continuous duty rating.
5. Operating the blowers at high altitude decreases their maximum pressure or vacuum duty rating. If this is a consideration, review the information on Fan Laws in the Application Engineering section of this catalog.
6. The exhaust air temperature of the blowers increases with increasing duty. At duties over 70 inH_2O it is too hot for most plastic pipe. Metal pipe must be considered. To prevent danger of burns, access to these pipes should be limited, guarded, or marked "Danger Hot."

Performance Data

The performance data shown in this catalog was determined under the following conditions:

- Line voltage @ 60 Hz 230V or 460V for three-phase units. 115V or 230V for single-phase units.
- Line voltage @ 50Hz 220V for three-phase or single-phase units.
- Units in a temperature stable condition.
- Delivery measurements made with output port throttled.
- Suction measurements made with input port throttled.
- Test Conditions: Inlet air density at 0.075 lbs per cu ft. [20 °C (68 °F), 29.92 inHg (14.7 PSIA)].
- Normal performance variations on the resistance curve within ± 10% of supplied data can be expected.

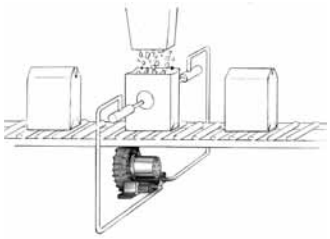
Typical Applications – Imagine what you can do with air,

We offer cost-effective solutions to blower applications for both OEMs and end-users. Gast's Regenerative Blower line of products are designed and built to meet the changing needs of industry and are ideally suited for a number of blower applications. These are examples of many applications where Gast's Regenerative Blowers are widely used.

PRESSURE APPLICATIONS

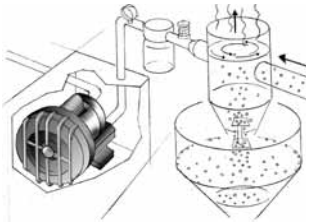
Bag Packaging Equipment

Vacuum is often used to open, hold, and close bags in filling machines.



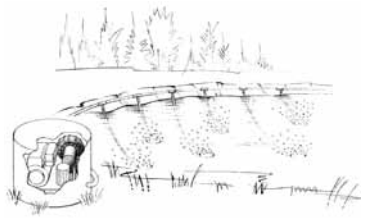
Vacuum Conveying

Plastic pellets, grain, powder, and other bulk dry materials can be transported from one container to another easily using vacuum. They are pulled into a transport tube and delivered to a separator before being deposited in the final storage container.



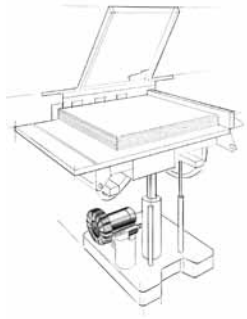
Pond Aeration

Pond aeration is done for two basic reasons. One is aquaculture, where large numbers of fish are "farmed" in a single pond. The second is ecological. As a pond or lake ages, it can lose its oxygen supply and may die. When air is introduced into a pond or lake, oxygen becomes plentiful again and life in and around the water can flourish.



Paper Stack Air Table

The stacks of paper in all graphic arts applications are extremely heavy. To make matters more difficult, the combination of high speed presses and the various types of paper make it necessary to handle these stacks frequently. To make the job easier, these stacks are floated on an air table so they can be manipulated with very little effort.



Agricultural equipment
- Aquaculture/pond aeration
- Fish hatchery equipment

Transportation equipment
- Suspension systems, tire inflators

Medical equipment
- Medical and dental sterilizing equipment
- Dental hand tools, air mattress

Industrial tools and machinery
- Fiberglass choppers
- Liquid/hydraulic pump drives
- Industrial cleaning equipment
- Chip removal/parts blowoff
- Engraving machinery

Material handling equipment
- Lift tables
- Pneumatic conveying systems and drives
- Automated assembly machines/robotics

Computer, business, office machines, and equipment
- Envelope opening/inserting/labeling equipment
- Document scanning equipment

Graphic arts equipment
- Folders, presses, counters
- Photo processing equipment
- Corrugated cutting/printing equipment
- Ink jet printer/post press printing equipment
- Collating/inserting equipment
- Ink drying equipment
- Air table

Sports and leisure equipment
- Spa and hot tub aeration, aquarium aeration
- Handicap tub door seals, boat/pond deicing

Food, drug, and chemical equipment
- Ice cream/yogurt/frosting dispensers
- Pharmaceutical manufacturing equipment
- Automated food preparation equipment

Electronics and communications equipment
- Cable pressurization/cable slicing equipment
- Circuit board processing equipment

Environment, pollution, and safety equipment
- Air/water purifiers
- Gas generators (ozone, nitrogen)
- Sewage treatment
- Smoke evacuation
- Pest control equipment
- Soil/groundwater remediation equipment

Packaging equipment
- Marking/labeling equipment
- Filling equipment
- Food packaging/bag making equipment
- Can/bottle making equipment
- Liquid packaging equipment
- Corrugated sheet making equipment

Textile industry equipment
- Sewing machine equipment, scrap collection equipment

Processing equipment
- Mixing equipment
- Vibrators/tumblers
- Plating tank agitation
- Laundry equipment
- Forming equipment
- Parts washers/parts drying equipment/air knives
- Plastic pellet drying/conveying

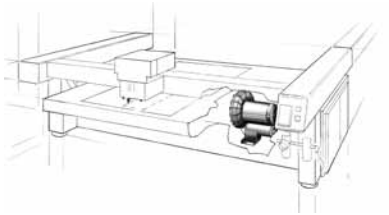
Energy equipment
- Oil atomization, industrial burners

Mining and construction equipment
- Texture spraying, concrete aeration

VACUUM APPLICATIONS

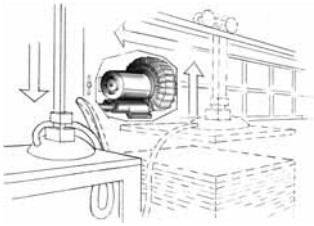
Vacuum Holding of Automated Cutting

Lasers, water jets, and knives are all precision tools for cutting a wide variety of materials automatically. These computer driven machines use vacuum to hold materials being cut in place.



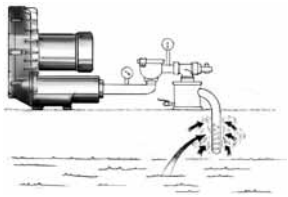
Automated Product Feeding

Vacuum force is used to automatically stack product as it is received or to move the product from one process to another.



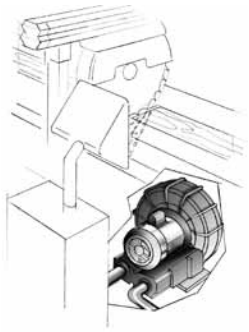
Soil Vapor Extraction

Contaminated soil is often treated by pulling the contaminants, usually gasoline or other hydrocarbons, out of the soil with vacuum.



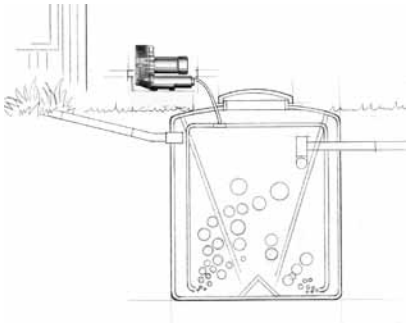
Dust and Chip Collection

Vacuum power is used to collect dust and/or chips from saws, mills, and other cutting machines.



Home Aerobic Sewage Treatment

Some parts of the country where city sewerage is not available and high water tables exist, household waste must be treated aerobically. This means air is mixed into a solution which activates microbes that feed on the waste, speeding up the naturally occurring organic breakdown.



Agricultural equipment
- Inoculation equipment

Medical equipment
- Dental vacuum ovens, dental aspiration

Industrial tools and machinery
- Gas reclaiming equipment
- House air/vacuum
- Industrial vacuum systems
- Industrial cleaning equipment
- Vacuum table/hold down
- Dust collection equipment
- Chip removal
- Engraving machinery

Material handling equipment
- Vacuum hoist
- Pneumatic conveying systems
- Pneumatic tube systems
- Automated assembly machines

Computer, business, office machines, and equipment
- Envelope opening/inserting/labeling equipment
- Vacuum feed, document scanning equipment

Graphic arts equipment
- Folders, presses
- Vacuum frames
- Photo processing equipment
- Paper counters
- Camera/exposure equipment
- Corrugated cutting/printing equipment
- Collating equipment
- Inserting equipment
- Post press printing equipment

Food, drug and chemical equipment
- Pharmaceutical manufacturing equipment
- Automated food preparation equipment
- Electronics and communications equipment
- Circuit board processing equipment
- Cable splicing equipment

Environment, pollution, and safety equipment
- Air sampling/monitoring equipment
- Toilet systems
- Fume extraction
- Vapor recovery
- Smoke evacuation
- Pest control equipment
- Soil vapor extraction
- Weather prediction equipment

Packaging equipment
- Case erectors/packers
- Marking/labeling equipment
- Bag making equipment
- Filling equipment
- Food packaging equipment
- Can/bottle making equipment
- Liquid packaging equipment
- Corrugated sheet making equipment
- Packing fill removal equipment

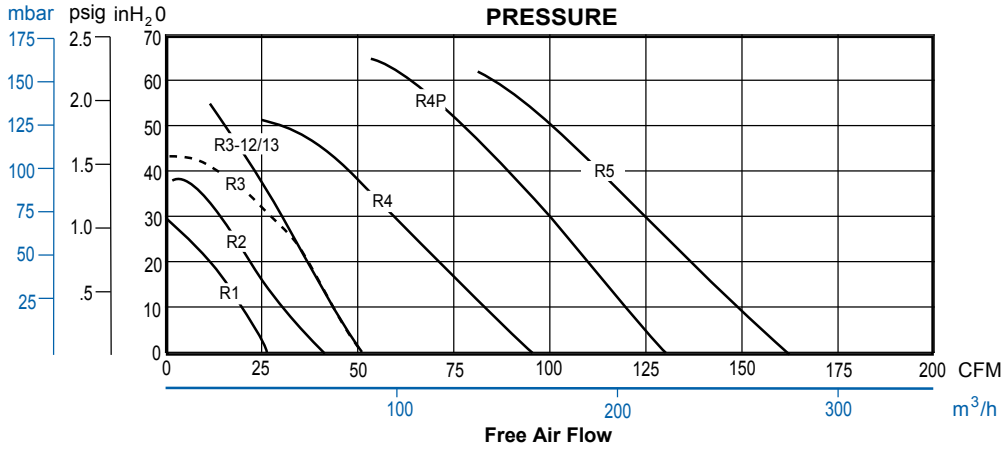
Textile industry equipment
- Sewing machine equipment
- Scrap collection equipment
- Garment vacuum tables
- Trim removal

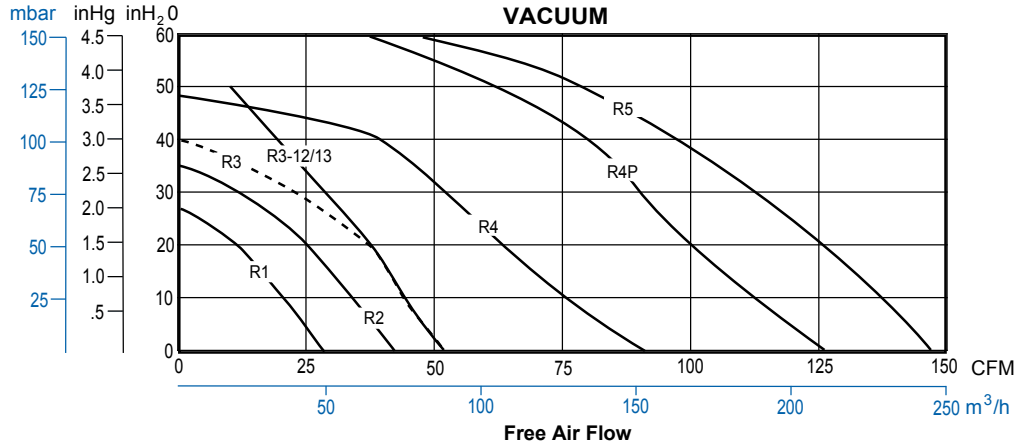
Processing equipment
- Vibrators/tumblers, non-medical lab equipment
- Forming equipment, plastic pellet drying/conveying

Performance Curves - Low Range for Pressure/Vacuum

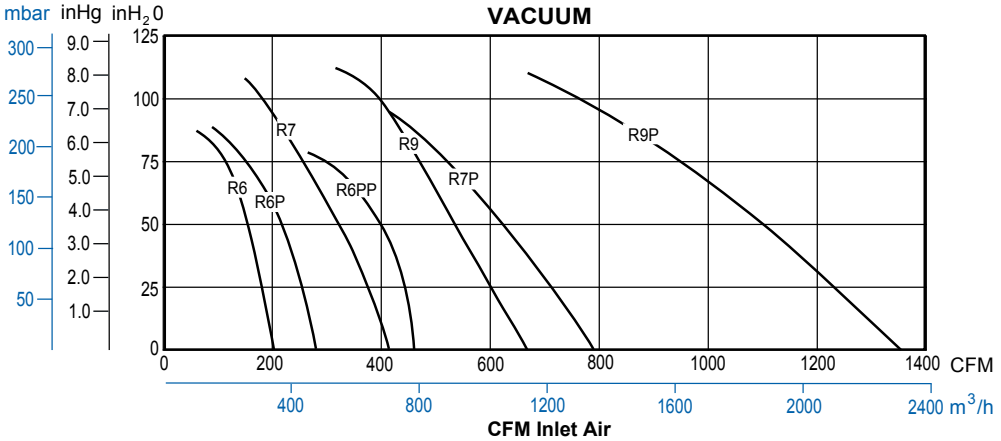
Motor mounted series R1, R2, R3, R4, R4P, R5

Performance at 60 Hz





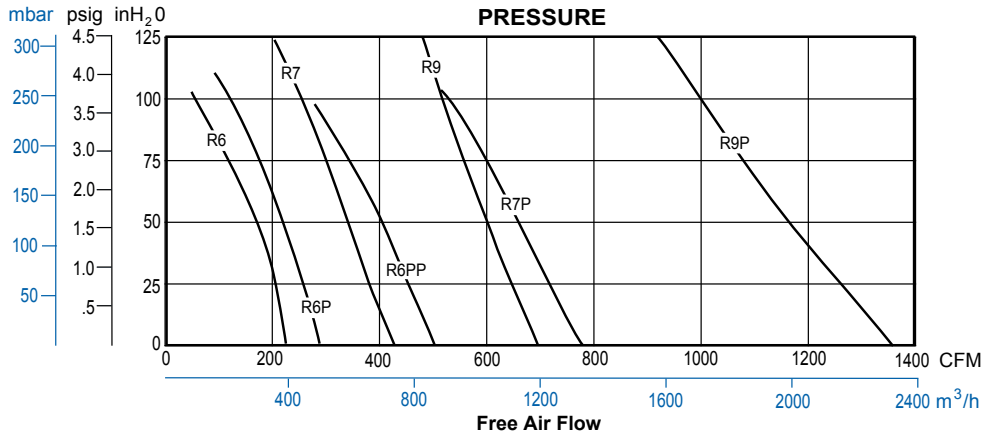
Gast advertises blower performance in Free Air Flow, or air subjected to only atmospheric pressure. (See above curves)
Some blower manufacturers advertise vacuum performance in CFM Inlet Air - measurement of the suction of air at a specific temperature at the inlet port and a specific discharge pressure at the exhaust port, which can be perceived as enhanced performance over Free Air Flow rated blowers. Therefore, we are also providing the following vacuum performance for Gast blowers in CFM Inlet Air for comparison to other blower manufacturer's advertising.

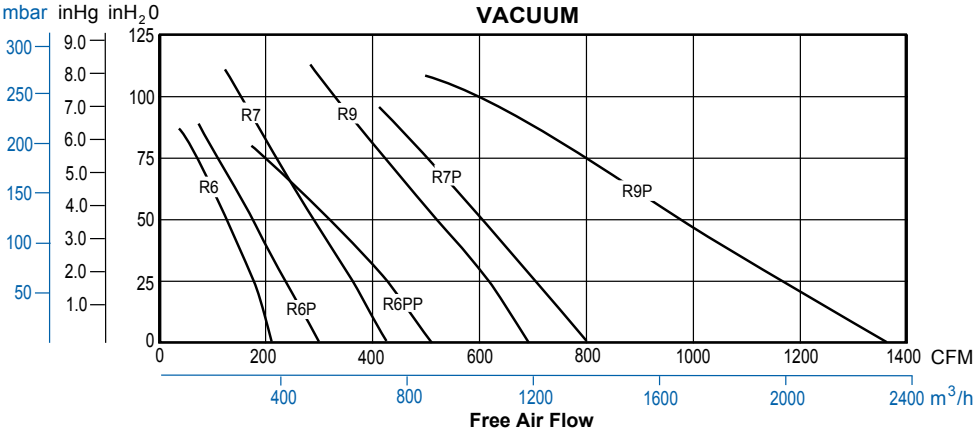


Performance Curves - Mid Range for Pressure/Vacuum

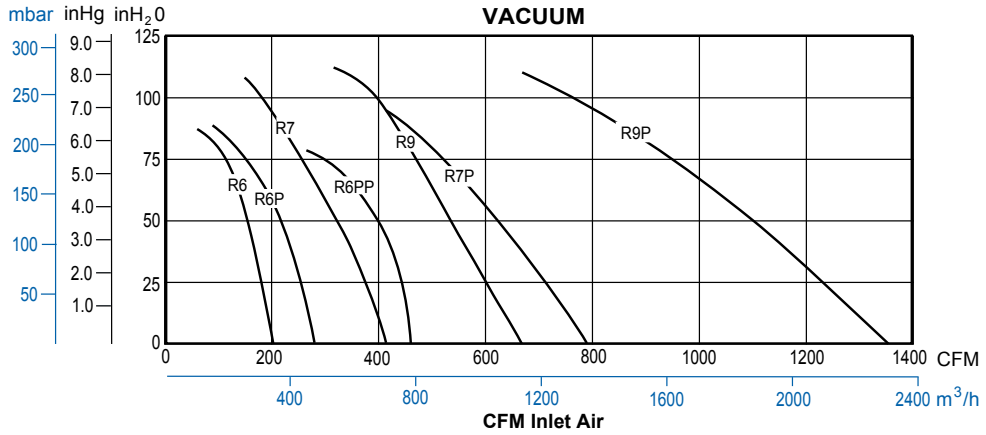
Motor mounted series R6, R6P, R6PP, R7, R7P, R9, R9P

Performance at 60 Hz





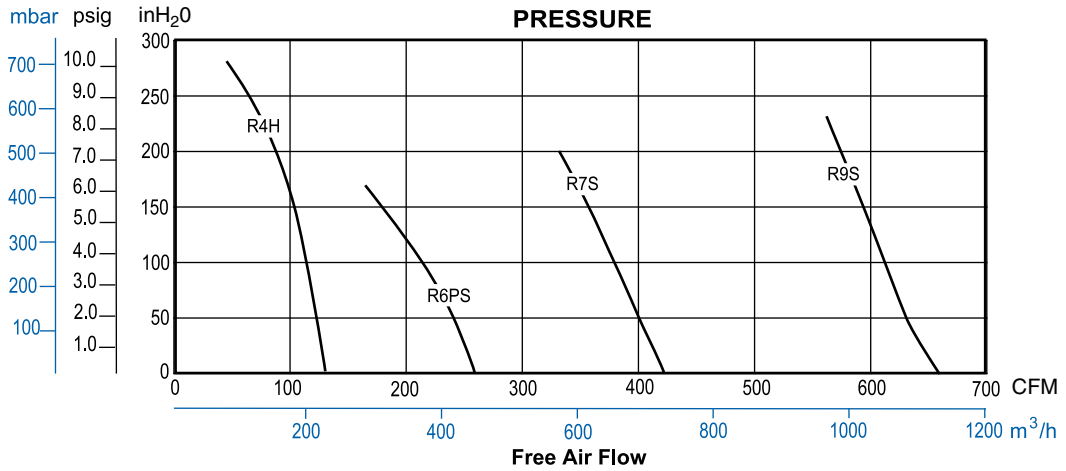
Gast advertises blower performance in Free Air Flow, or air subjected to only atmospheric pressure. (See above curves)
Some blower manufacturers advertise vacuum performance in CFM Inlet Air - measurement of the suction of air at a specific temperature at the inlet port and a specific discharge pressure at the exhaust port, which can be perceived as enhanced performance over Free Air Flow rated blowers. Therefore, we are also providing the following vacuum performance for Gast blowers in CFM Inlet Air for comparison to other blower manufacturer's advertising.

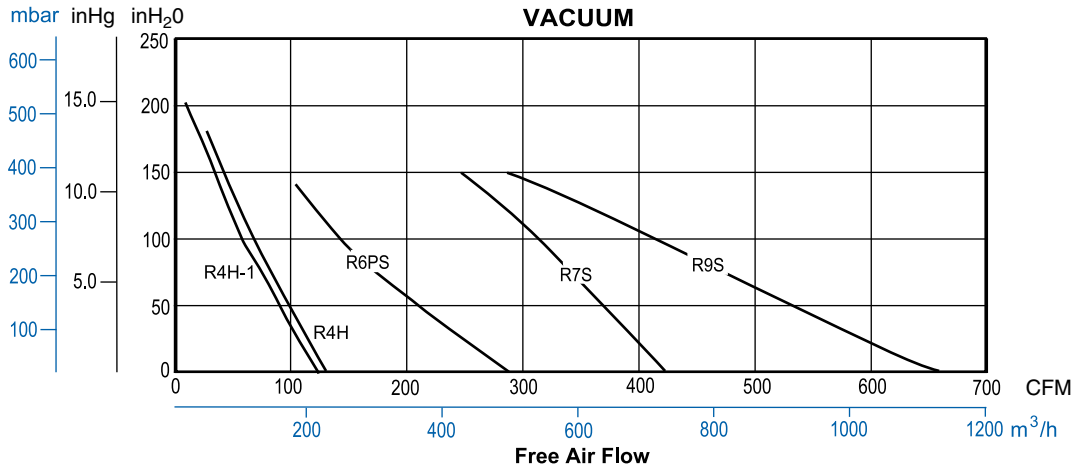


Performance Curves - High Range for Pressure/Vacuum

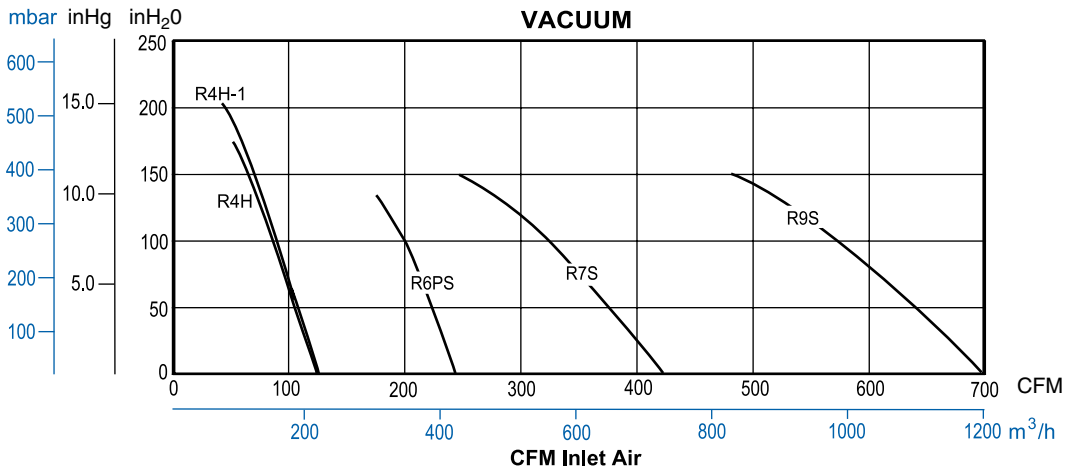
Motor mounted series R4H, R4H-1, R6PS, R7S, R9S

Performance at 60 Hz





Gast advertises blower performance in Free Air Flow, or air subjected to only atmospheric pressure. (See above curves)
Some blower manufacturers advertise vacuum performance in CFM Inlet Air - measurement of the suction of air at a specific temperature at the inlet port and a specific discharge pressure at the exhaust port, which can be perceived as enhanced performance over Free Air Flow rated blowers. Therefore, we are also providing the following vacuum performance for Gast blowers in CFM Inlet Air for comparison to other blower manufacturer's advertising.

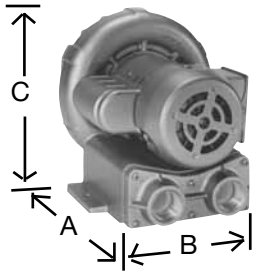


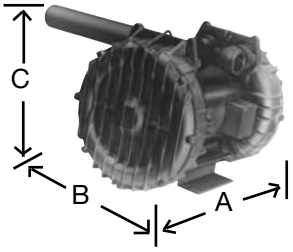
Envelope Dimensions

Model #	Net Wt. (lbs)	A Length (inches)	B Width (inches)	C Height (inches)	Inlet/Outlet Connections
STANDARD MOTOR MOUNTED					
R1102	16	8.86	7.80	8.51	1”
R1102C	16	8.86	7.80	8.51	1”
R1102K	16	9.21	7.80	8.51	1”
R2103	21	9.90	8.93	9.29	1”
R2105	23	10.57	8.93	9.29	1”
R2303A	23	9.90	8.93	9.29	1”
R2305B	23	10.85	8.93	9.29	1”
R3105-1	29	10.94	9.72	10.15	1¼”
R3105-12	29	10.94	9.72	10.15	1¼”
R3305A-1	29	10.94	9.72	1015	1¼”
R3305A-13	29	10.94	9.72	10.15	1¼”
R4110-2	41	12.82	11.25	11.80	1½”
R4310A-2	41	12.82	11.25	11.80	1½”
R4310B-1	41	12.82	11.25	11.80	1½”
R4P115	61	15.46	13.26	13.61	1½”
R4P315A	43	11.38	13.26	13.61	1½”
R5125-2	76	16.14	13.56	13.80	1½”
R5325A-2	65	15.23	13.56	13.80	1½”
R5325B-1	65	14.73	13.56	13.80	1½”
R6125-2	87	16.45	15.17	15.38	2”
R6325A-2	76	15.53	15.17	15.38	2”
R6135J-10	112	15.86	15.17	15.38	2”
R6335A-2	82	16.59	15.17	15.38	2”
R6335B	82	16.00	15.17	15.38	2”
R6150J-2	125	17.46	15.17	15.38	2”
R6350A-2	112	17.35	15.17	15.38	2”
R6350B-2	112	17.35	15.17	15.38	2”
R6P335A	150	16.69	16.75	18.15	2”
R6P350A	176	17.75	16.75	18.15	2”
R6P350B	176	17.75	16.75	18.15	2”
R6P355A	215	19.92	16.75	18.15	2”
R6PP3110M	309	23.19	16.75*	18.21	2”/ 3”
R7100A-3	293	22.58	18.00	20.03	2½”
R7100B-1	290	21.58	18.00	20.03	2½”
R7P3180M	438	28.47	18.00*	20.12	2½”/ 4”
R93150A	452	26.13	20.63	22.63	3”
R9P3300M	622	32.78	20.63*	22.54	3”/ 5”
HIGH PRESSURE MODELS					
R4H3060A	200	21.47	16.90	18.82	2”
R4H3060A-1	200	21.47	16.90	18.82	2”
R6PS3110M	309	23.19	16.75	18.21	2”
R7S3180M	431	28.47	18.00	20.12	2½”
R9S3300M	606	32.78	20.63*	22.54	3”
EXPLOSION PROOF MOTOR MODELS					
R3105N-50	52	12.3	12.75	10.15	1¼”
R4110N-50	60	15.34	12.34	11.80	1½”
R4310P-50	58	14.09	12.34	11.80	1½”
R4P115N-50	79	17.41	13.75	13.61	1½”
R5125Q-50	77	17.59	13.72	13.80	1½”
R5325R-50	75	16.75	13.56	13.80	1½”
R6130Q-50	129	18.97	15.17	15.34	2”
R6340R-50	112	18.82	15.17	15.34	2”
R6P155Q-50	243	22.81	16.75	18.14	2”
R6P355R-50					
R7100R-50	297	22.77	18.00	20.03	2½”
SEPARATE DRIVE MODELS					
SDR4	27	12.44	11.25	11.80	1½”
SDR5	37	14.22	13.56	13.78	1½”
SDR6	70	15.89	15.17	15.34	2”

*Less muffler(s)

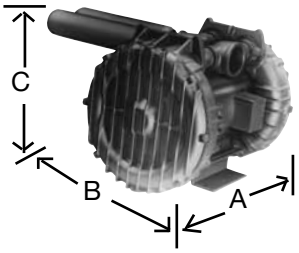
BASIC STYLE
R1, R2, R3, R4, R4H, R4P, R5, R6, R6P, R7, R9

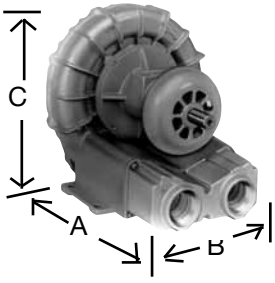




STAGED
R6PS, R7S, R9S

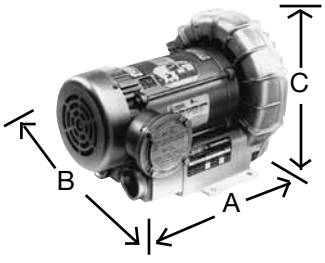
PARALLEL
R6PP, R7P, R9P





SEPARATE DRIVE
SDR4, SDR5, SDR6,

EXPLOSION PROOF MOTOR MODELS
R3, R4, R4P, R5, R6, R6P, R7



AC Motor

DC Motor

Models R1102, R1102C, R1102K

Max. Pressure – 28.5 inH_2O (60 Hz), 21 inH_2O (50 Hz)
Max. Vacuum – 26.5 inH_2O (60 Hz), 20 inH_2O (50 Hz)
Max. Air flow – 27 CFM (60 Hz), 23 CFM (50 Hz)

PRODUCT FEATURES

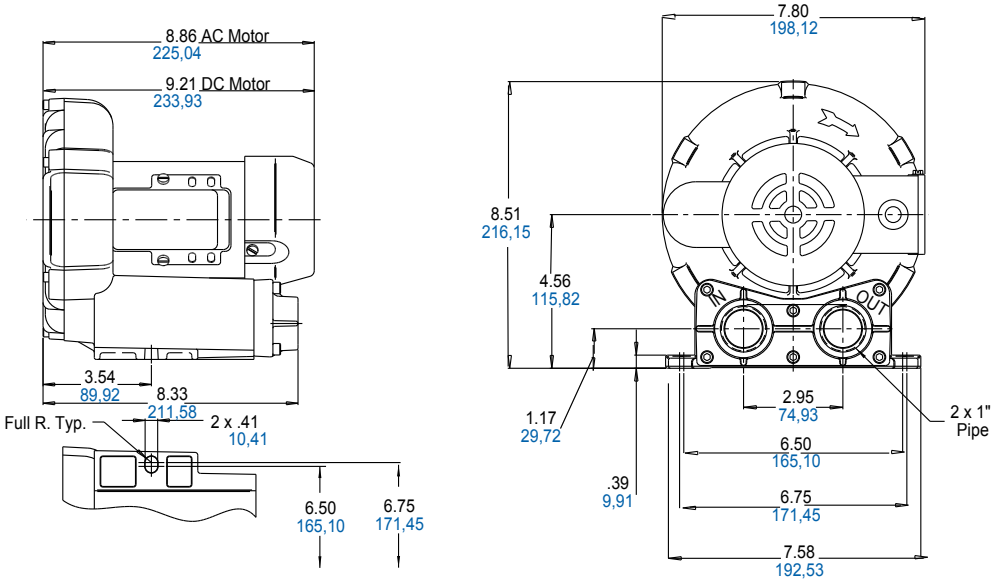
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings
- Automatic restart thermal protection on single phase AC motors
- Estimated 3,000 hour brush life on 12 volt DC motor
- Can be operated with no air flow through unit.
- Aluminum blower housing, impeller, and cover
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AJ496
- Inlet filter AJ126B (pressure)
- Vacuum gauge AJ497
- Inline filter AJ151A (vacuum)
- Muffler AJ121B
- K899 foam replacement kit for R1102

Product Dimensions (inches, mm)

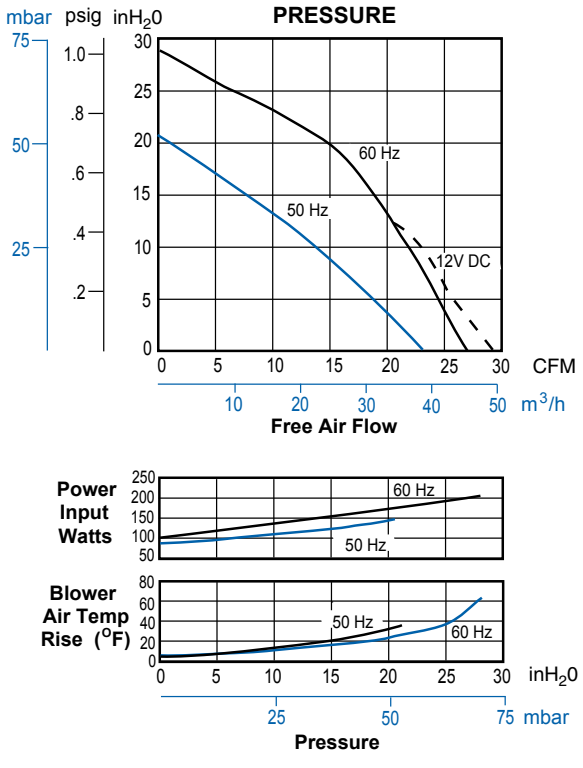
Models R1102, R1102C, R1102K,

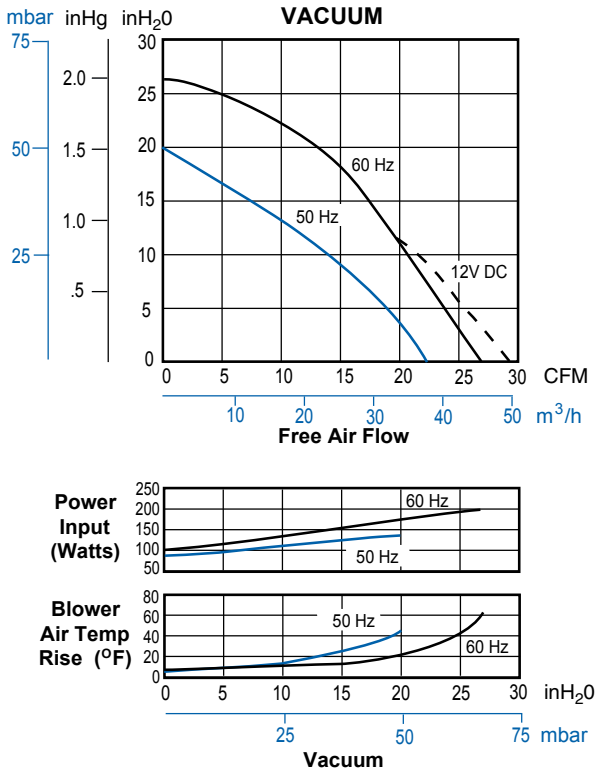


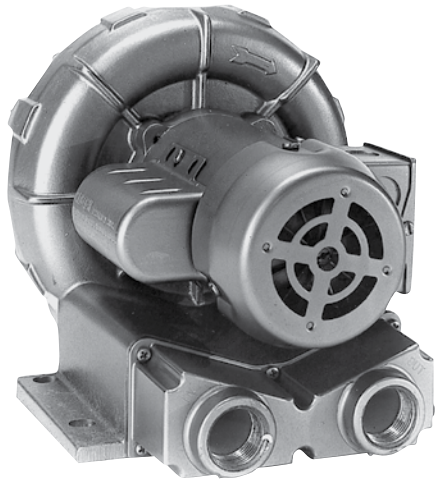
Product Specifications

MODEL NUMBER		R1102	R1102C	R1102K	R1302
Motor Enclosure		TEFC	TEFC	TEFC	TEFC
HP/kW	60 Hz	.125/0,09	.125/0,09	.125/0,09	.125/0.09
	50 Hz	.10/0,07	-	-	.10/0,07
Voltage	60 Hz	115/208-230-1	115-1	12V DC	208-230/460-3
	50 Hz	110/220-240-1	-	-	190-220/380-415-3
Amps	60 Hz	2.0/1.1-1.0	1.8	19 @ 12V DC	1.0-1.1/5
	50 Hz	2.0/1.1-1.0	-	-	1.0-1.1/.5-.6
Starting Amps	60 Hz	8.5 @ 115V	9.7	145 @ 12V DC	3.7 @ 230
	50 Hz	8.6 @ 220V	-	-	3.6 @ 220
Insulation Class		B	B	H	B
Recommended NEMA Starter Size		00/00	00	-	00/00
Net Weight (lbs/kg)		16/7,3	16/7,3	16/7,3	16/7,3

Product Performance







Models R2103, R2105, R2303A, R2305B

Max. Pressure – 39 inH_2O (60 Hz), 30 inH_2O (50 Hz)
Max. Vacuum – 35 inH_2O (60 Hz), 25 inH_2O (50 Hz)
Max. air flow – 42 CFM (60 Hz), 33 CFM (50 Hz)

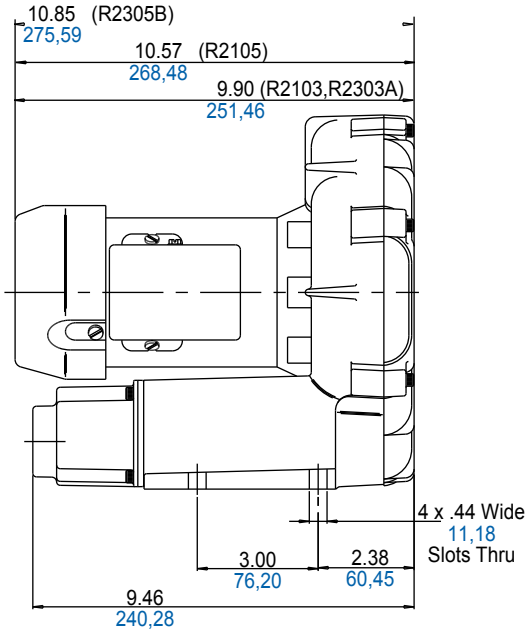
PRODUCT FEATURES

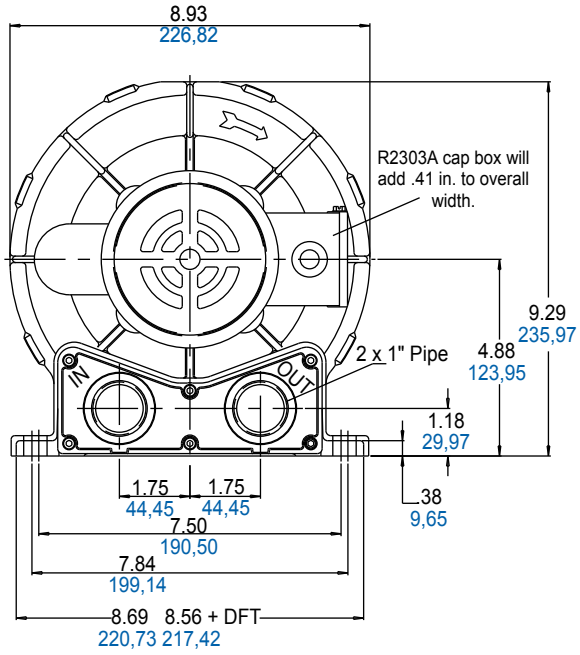
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings
- Automatic restart thermal protection on single phase motors
- Aluminum blower housing, impeller, and cover
- Can be operated with no air flow through unit
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AJ496
- Inlet filter AJ126B (pressure)
- Vacuum gauge AJ497
- Inline filter AJ151B (vacuum)
- Muffler AJ121B
- Foam replacement kit K900

Product Dimensions (inches, mm)

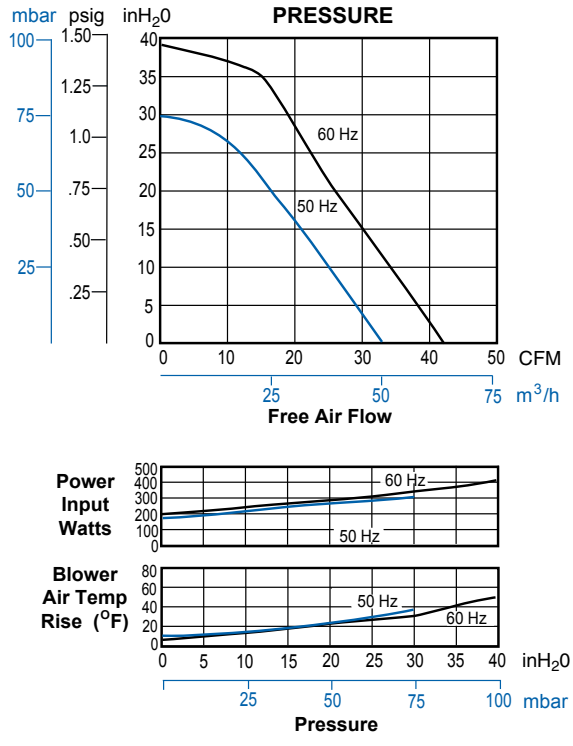


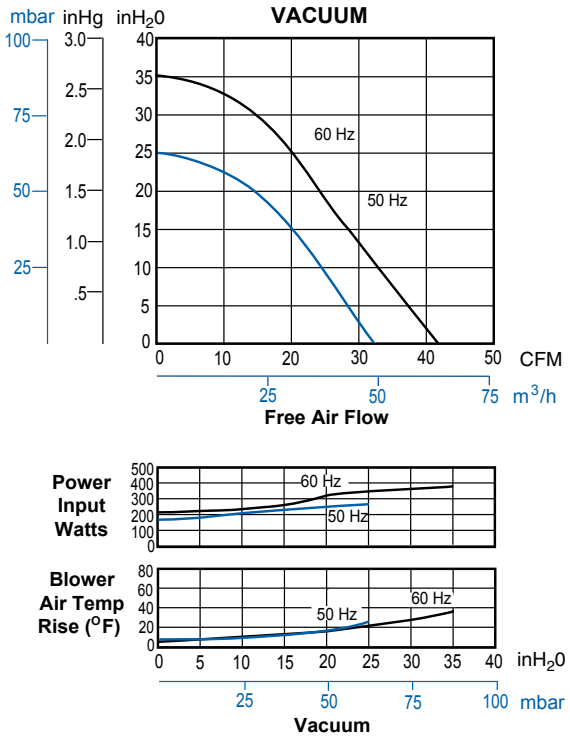


Product Specifications

MODEL NUMBER		R2103	R2105	R2303A	R2305B
Motor Enclosure		TEFC	TEFC	TEFC	TEFC
HP/kW	60 Hz	.33/0,25	.50/0,37	.33/0,25	.50/0,37
	50 Hz	.20/0,15	.33/0,25	.20/0,15	-
Voltage	60 Hz	115/208-230-1	115/208-230-1	208-230/460-3	575-3
	50 Hz	110/220-1	110/220-240-1	190-220/380-415-3	-
Amps	60 Hz	3.8/2.0-1.9	5.6/3.0-2.8	1.2-1.2/6	.7
	50 Hz	3.8/1.9	5.2/2.6-3.1	1.0-1.2/.5-.53	-
Starting Amps	60 Hz	9.3 @ 230V	23.2 @ 115V	8.0 @ 230V	4.2
	50 Hz	17.6 @ 220V	23 @ 220V	8.1 @ 220V	-
Insulation Class		B	B	B	B
Recommended NEMA Starter Size		00/00	00/00	00/00	00/00
Net Weight (lbs/kg)		21/9,5	23/10,4	23/10,4	23/10,4

Product Performance





Models R3105-1, R3305A-1

Max. pressure – 43 inH_2O (60 Hz), 31 inH_2O (50 Hz)
Max. vacuum – 40 inH_2O (60 Hz), 28 inH_2O (50 Hz)
Max. air flow – 53 CFM (60 Hz), 44 CFM (50 Hz)

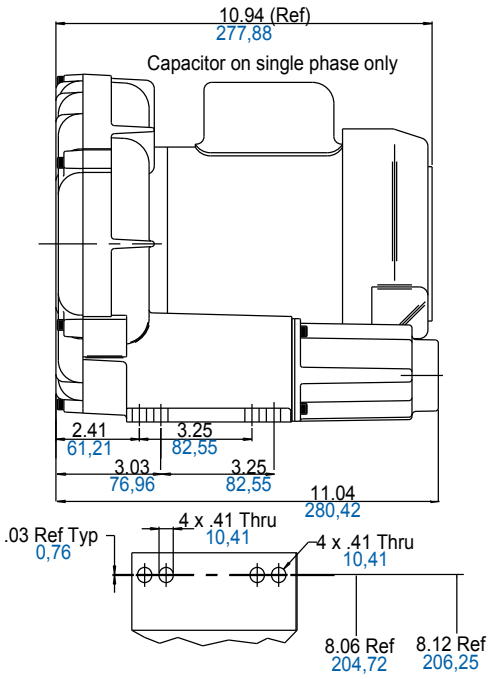
PRODUCT FEATURES

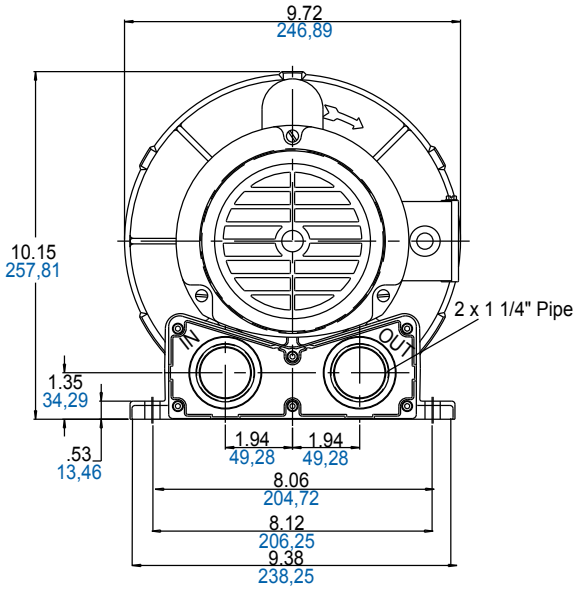
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings
- Automatic restart thermal protection on single phase motors
- Aluminum blower housing, impeller, and cover
- Can be operated with no air flow through unit
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AJ496
- Inlet filter AJ126C (pressure)
- Vacuum gauge AJ497
- Inline filter AJ151C (vacuum)
- Muffler AJ121C
- Foam replacement kit K901

Product Dimensions (inches, mm)

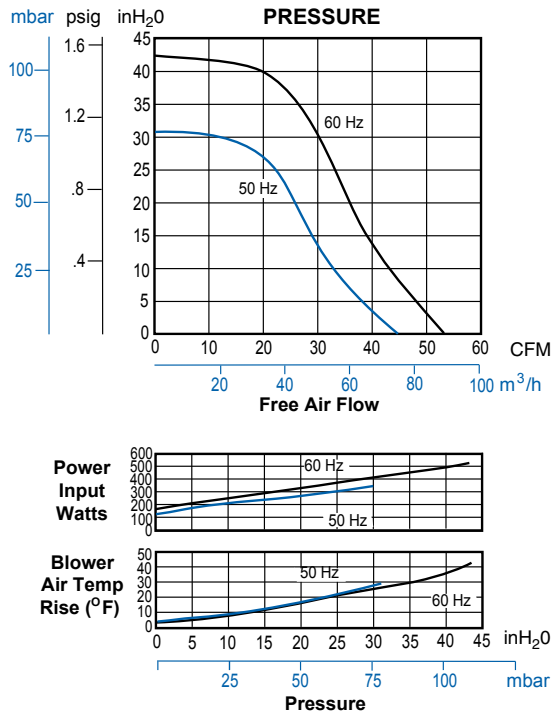


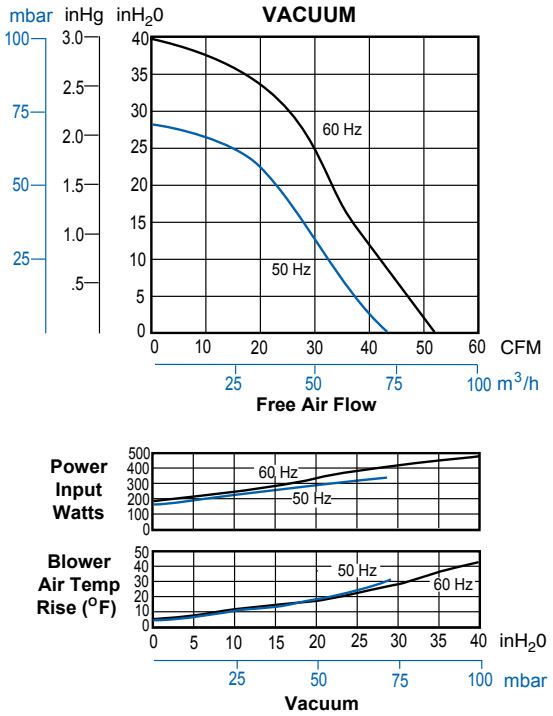


Product Specifications

MODEL NUMBER		R3105-1	R3305A-1
Motor Enclosure		TEFC	TEFC
HP/kW	60 Hz	.50/0,37	.50/0,37
	50 Hz	.33/0,25	.33/0,25
Voltage	60 Hz	115/208-230-1	208-230/460-3
	50 Hz	110/220-240-1	190-220/380-415-3
Amps	60 Hz	5.6/3.0-2.8	2.0-2.0/1.0
	50 Hz	5.2/2.6-3.1	1.6-1.8/.8-.84
Starting Amps	60 Hz	23.2 @ 115V	10.0 @ 230V
	50 Hz	23 @ 220V	7.9 @ 220V
Insulation Class		B	B
Recommended NEMA Starter Size		00/00	00/00
Net Weight (lbs/kg)		29/13,2	29/13,2

Product Performance





Models R3105-12, R3305A-13

Max. pressure – 55 inH_2O (60 Hz), 40 inH_2O (50 Hz)
Max. vacuum – 50 inH_2O (60 Hz), 35 inH_2O (50 Hz)
Max. air flow – 52 CFM (60 Hz), 43 CFM (50 Hz)

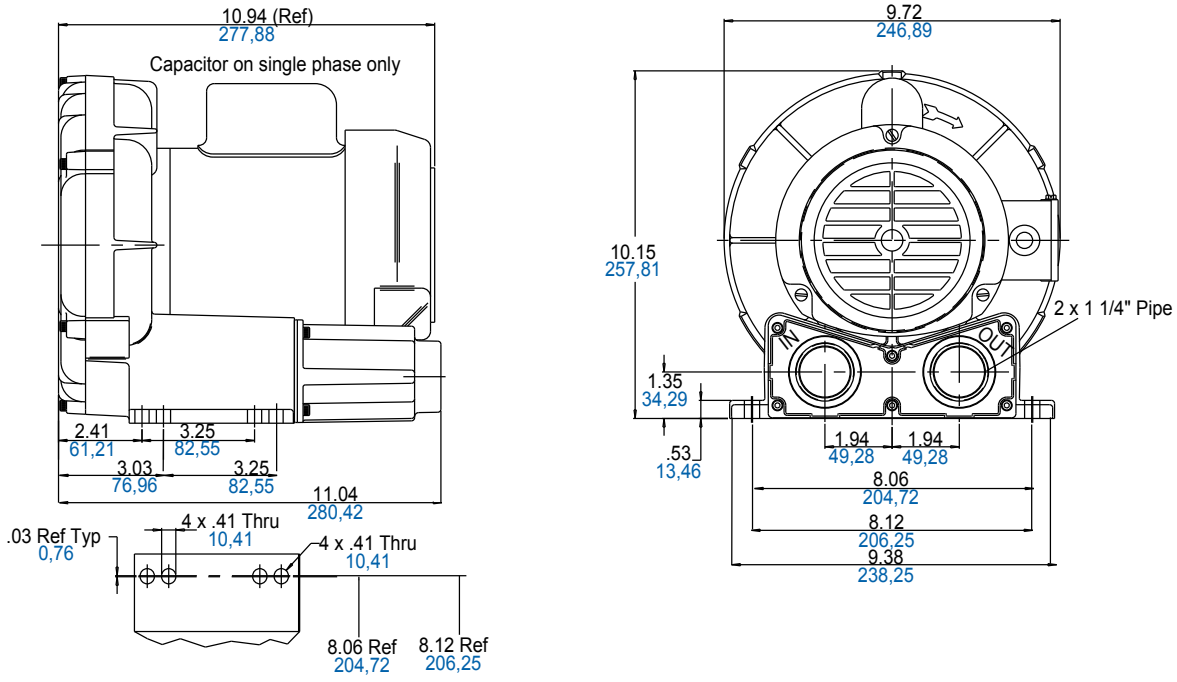
PRODUCT FEATURES

- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings
- Automatic restart thermal protection on single phase motors
- Aluminum blower housing, impeller, and cover
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AJ496
- Inlet filter AJ126C (pressure)
- Vacuum gauge AJ497
- Inline filter AJ151C (vacuum)
- Muffler AJ121C

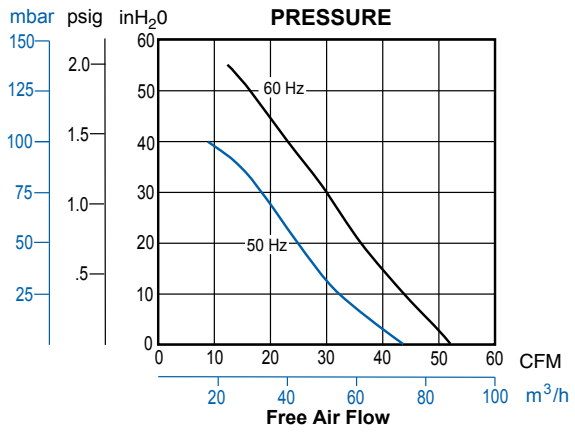
Product Dimensions (inches, mm)

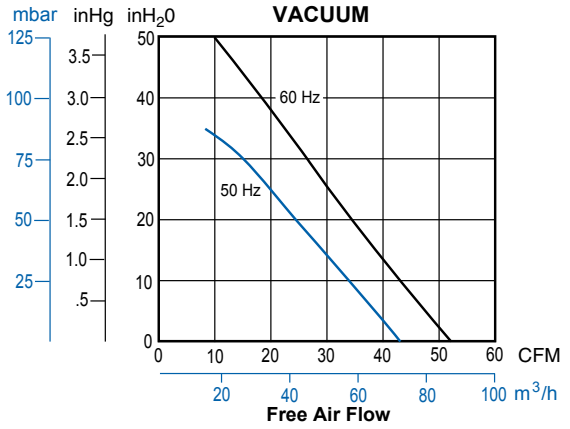


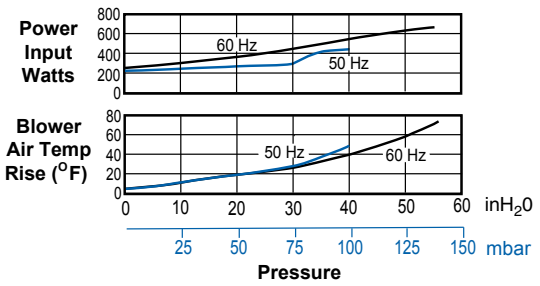
Product Specifications

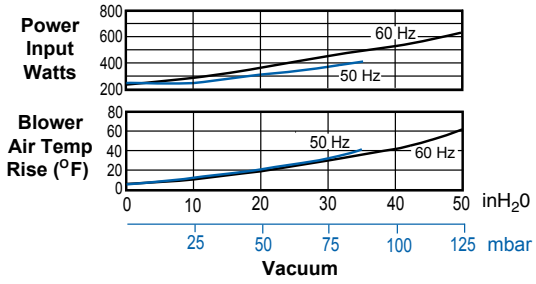
MODEL NUMBER		R3105-12	R3305A-13
Motor Enclosure		TEFC	TEFC
HP/kW	60 Hz	.50/0,37	.50/0,37
	50 Hz	.33/0,25	.33/0,25
Voltage	60 Hz	115/208-230-1	208-230/460-3
	50 Hz	110/220-240-1	190-220/380-415-3
Amps	60 Hz	5.6/3.0-2.8	2.0-2.0/1.0
	50 Hz	5.2/2.6-3.1	1.6-1.8/.8-.84
Starting Amps	60 Hz	23.2 @ 115V	10.0 @ 230V
	50 Hz	23 @ 220V	7.9 @ 220V
Insulation Class		B	B
Recommended NEMA Starter Size		00/00	00/00
Net Weight (lbs/kg)		29/13,2	29/13,2

Product Performance









Models R4110-2, R4310A-2, R4310B-1

Max. pressure – 52 inH_2O (60 Hz), 38 inH_2O (50 Hz)
Max. vacuum – 48 inH_2O (60 Hz), 35 inH_2O (50 Hz)
Max. air flow – 92 CFM (60 Hz), 75 CFM (50 Hz)

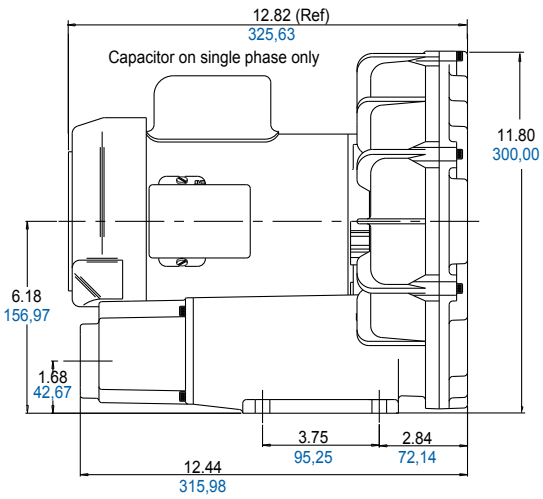
PRODUCT FEATURES

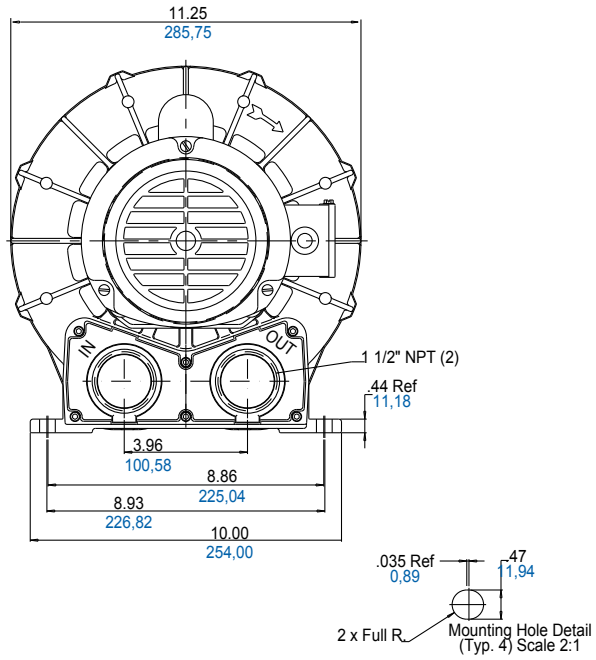
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings
- Automatic restart thermal protection on single phase motors
- Aluminum blower housing, impeller, and cover
- Can be operated with no air flow through unit
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AJ496
- Inlet filter AJ126D (pressure)
- Vacuum gauge AJ497
- Inline filter AJ151D (vacuum)
- Muffler AJ121D
- Relief valve AG258
- Liquid separator RMS160 (vacuum)
- Foam replacement kit K902

Product Dimensions (inches, mm)

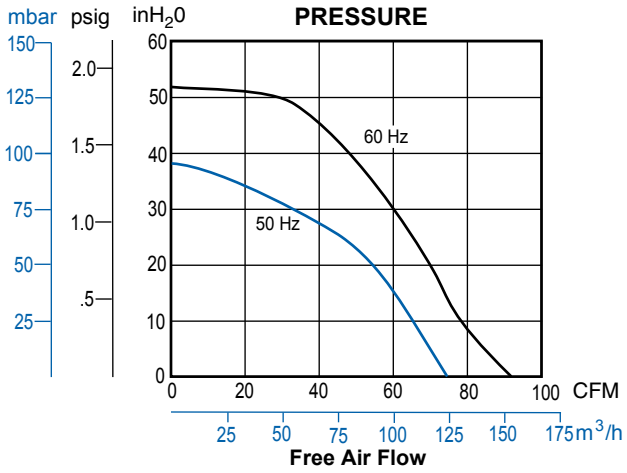


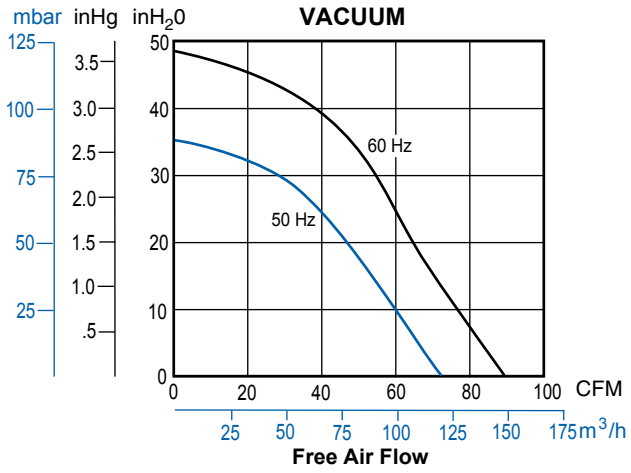


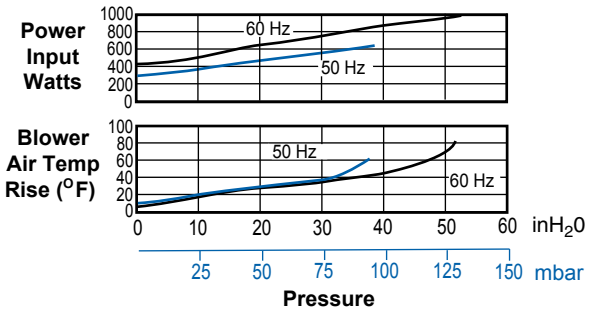
Product Specifications

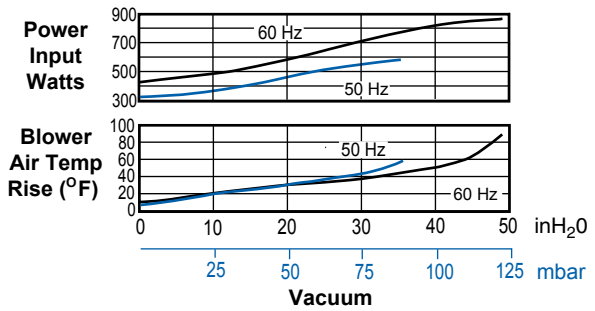
MODEL NUMBER		R4110-2	R4310A-2	R4310B-1
Motor Enclosure		TEFC	TEFC	TEFC
HP/kW	60 Hz	1.0/0,75	1.0/0,75	1.0/0,75
	50 Hz	.6/0,45	.6/0,45	-
Voltage	60 Hz	115/208-230-1	208-230/460-3	575-3
	50 Hz	110/220-240-1	190-220/380-415-3	-
Amps	60 Hz	9.8/5.2-4.9	3.4-3.2/1.6	1.25
	50 Hz	9.0/4.5-5.7	2.6-3.3/1.3-1.4	-
Starting Amps	60 Hz	31.2 @ 230V	26.5 @ 230V	7.6
	50 Hz	34 @ 220V	28.4 @ 220V	-
Insulation Class		B	B	B
Recommended NEMA Starter Size		0/00	00/00	00
Net Weight (lbs/kg)		41/18,6	41/18,6	41/18,6

Product Performance









Models R4P115, R4P315A

Max. pressure – 65 inH_2O (60 Hz), 50 inH_2O (50 Hz)
Max. vacuum – 60 inH_2O (60 Hz), 45 inH_2O (50Hz)
Max. air flow – 127 CFM (60 Hz), 110 CFM (50 Hz)

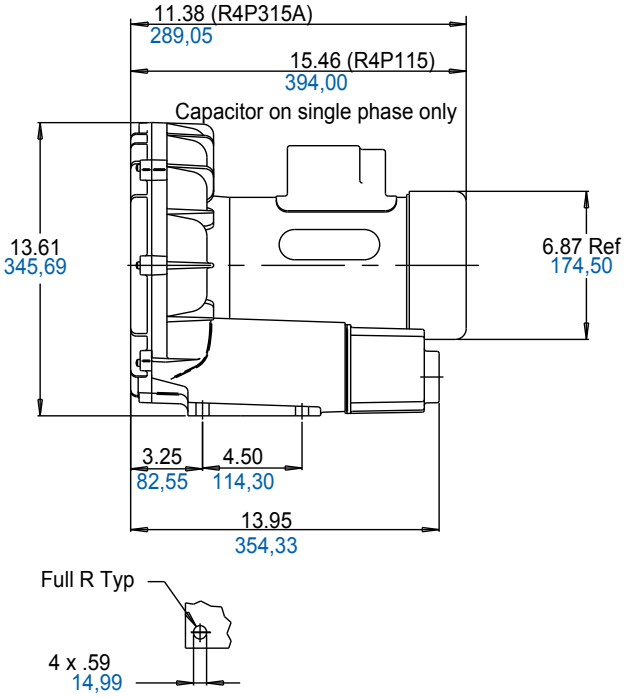
PRODUCT FEATURES

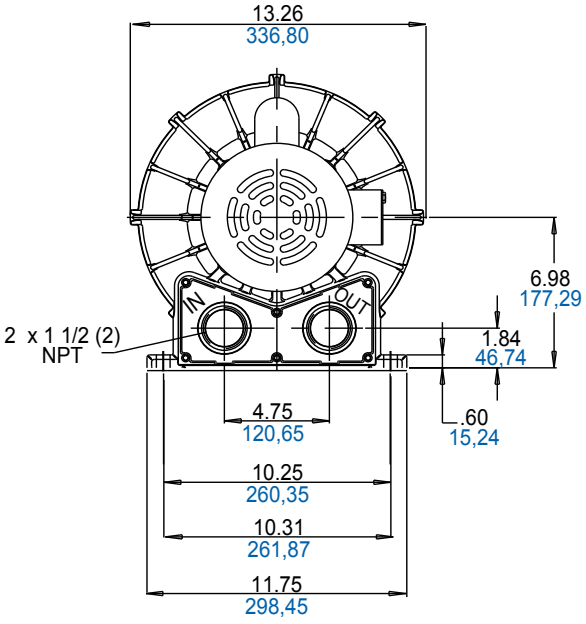
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings
- Automatic restart thermal protection on single phase motors
- Aluminum blower housing, impeller, and cover
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AE133
- Inlet filter AJ126D (pressure)
- Vacuum gauge AJ497
- Inline filter AJ151E (vacuum)
- Muffler AJ121D
- Relief valve AG258
- Liquid separator RMS200 (vacuum)
- Foam replacement kit K906

Product Dimensions (inches, mm)

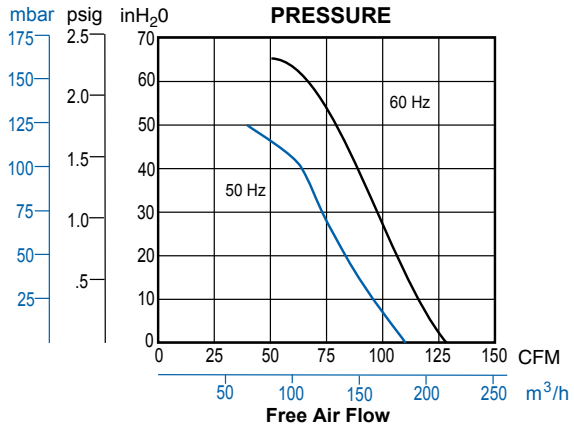


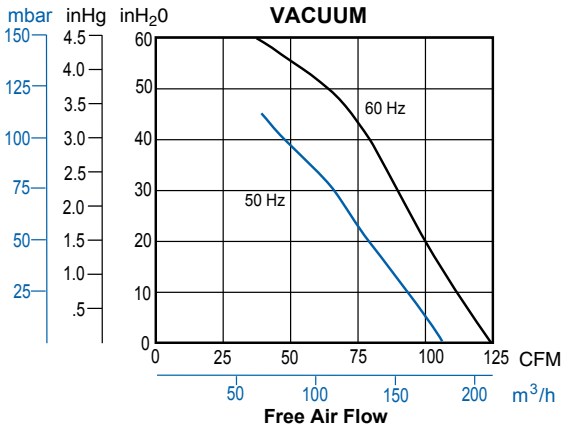


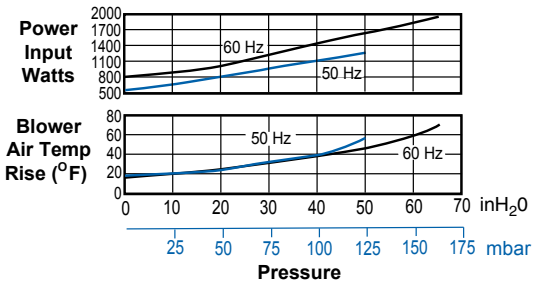
Product Specifications

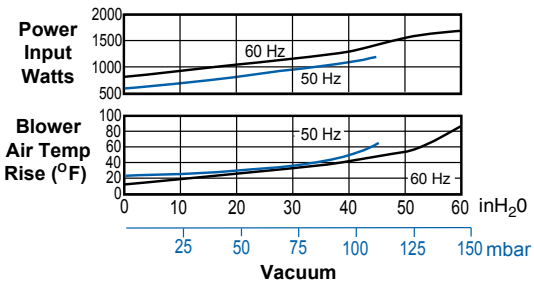
MODEL NUMBER		R4P115	R4P315A
Motor Enclosure		TEFC	TEFC
HP/kW	60 Hz	1.5/1,1	1.5/1,1
	50 Hz	1.0/0,75	1.0/0,75
Voltage	60 Hz	115/208-230-1	208-230/460-3
	50 Hz	110/220-240-1	190-220/380-415-3
Amps	60 Hz	17.5/10-9	5.1-4.9/2.5
	50 Hz	14.2/8.1	3.9-4.3/1.9-2.0
Starting Amps	60 Hz	58 @ 230V	18.5 @ 460V
	50 Hz	56 @ 220V	19 @ 380V
Insulation Class		F	B
Recommended NEMA Starter Size		1/0	00/00
Net Weight (lbs/kg)		61/27,7	43/24,1

Product Performance









Models R5125-2, R5325A-2, R5325B-1

Max. pressure – 65 inH_2O (60 Hz), 50 inH_2O (50 Hz)
Max. vacuum – 60 inH_2O (60 Hz), 47 inH_2O (50 Hz)
Max. air flow – 160 CFM (60 Hz), 133 CFM (50 Hz)

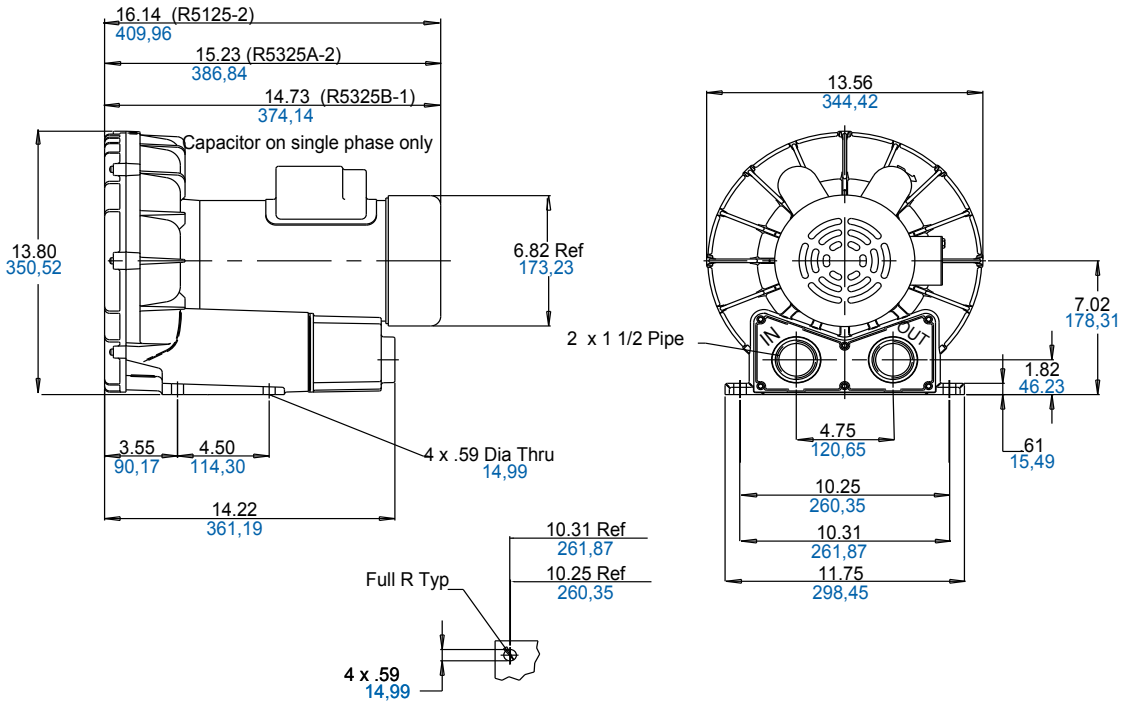
PRODUCT FEATURES

- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings
- Automatic restart thermal protection on single phase motors
- Aluminum blower housing, impeller, and cover
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AE133
- Inlet Filter AJ126D (pressure)
- Vacuum gauge AJ497
- Inline filter AJ151E (vacuum)
- Muffler AJ121D
- Relief valve AG258
- Liquid separator RMS200 (vacuum)
- Foam replacement kit K903

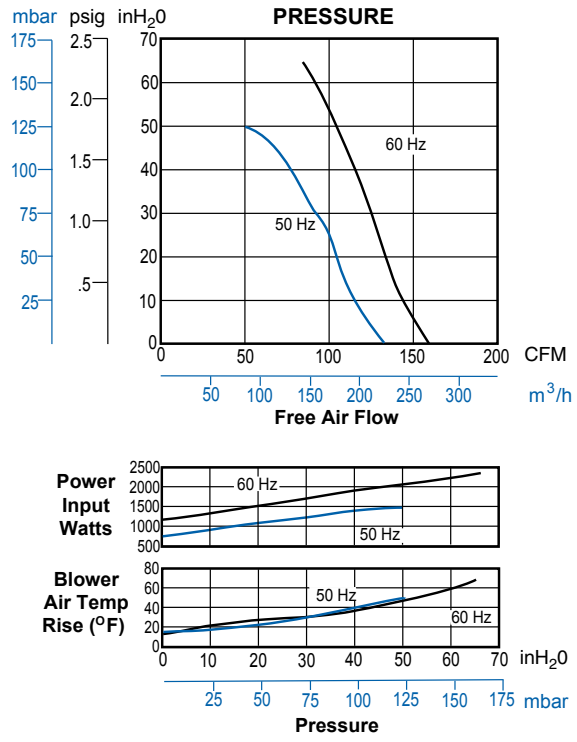
Product Dimensions (inches, mm)

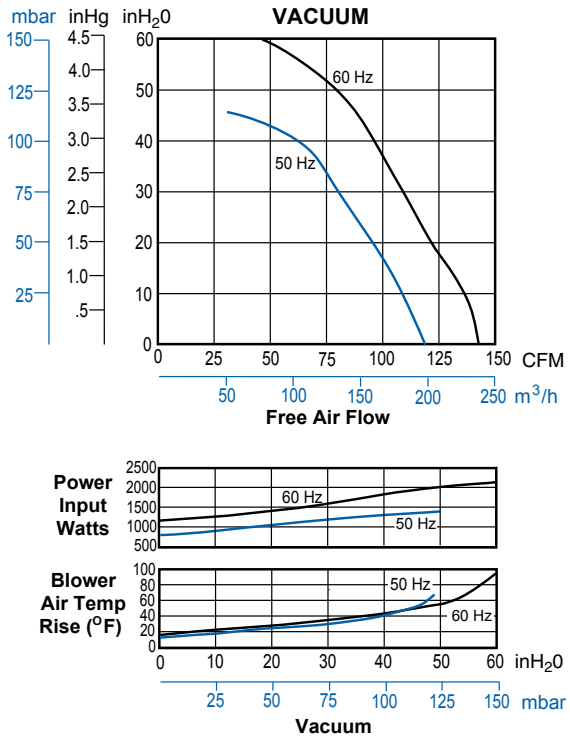


Product Specifications

MODEL NUMBER		R5125-2	R5325A-2	R5325B-1
Motor Enclosure		TEFC	TEFC	TEFC
HP/kW	60 Hz	2.5/1,9	2.5/1,9	2.5/1,9
	50 Hz	1.5/1,1	1.85/1,38	-
Voltage	60 Hz	115/208-230-1	208-230/460-3	575-3
	50 Hz	110/220-240-1	190-220/380-415-3	-
Amps	60 Hz	21/12-10	6.9-6.9/3.45	2.9
	50 Hz	16.5/8.6	6.6-6.7/3.3-3.5	-
Starting Amps	60 Hz	58 @ 230V	58 @ 230V	23.4
	50 Hz	42 @ 230V	23 @ 380V	-
Insulation Class		F	B	B
Recommended NEMA Starter Size		1/0	0/00	0
Net Weight (lbs/kg)		76/34,5	65/29,5	65/29,5

Product Performance





MODELS	Maximum Pressure (inH_2O) 60 Hz	50 Hz	Maximum Vacuum (inH_2O) 60 Hz	50 Hz	Maximum Air Flow (CFM) 60 Hz	50 Hz
R6125-2 R6325A-2	45	40	55	50	215	180
R6135J-10 R6335A-2 R6335B	80	75	80	65	215	180
R6150J-2 R6350A-2 R6350B-2	105	78	88	70	207	180

Models R6125-2, R6325A-2, R6135J-10, R6335A-2, R6335B, R6150J-2, R6350A-2, R6350B-2

Maximum pressure, vacuum, and air flow varies for the r6 series, depending on the model(s). Reference the chart for the specific model performance.

PRODUCT FEATURES

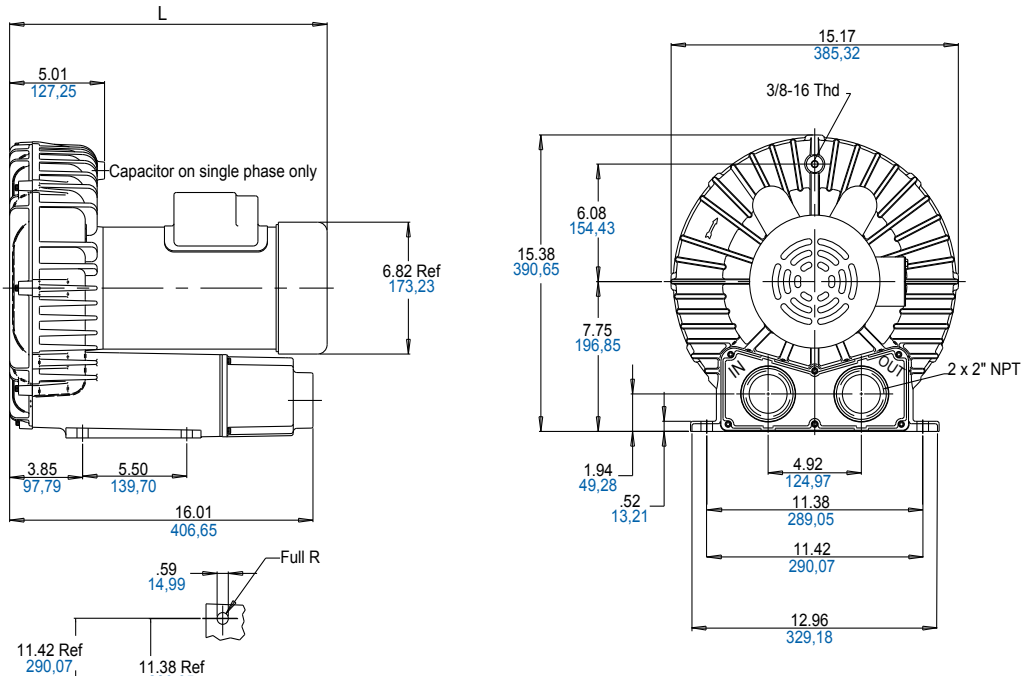
- Made in the U.S.A.
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings (R6150J-2 and R6135J-10 has ODP motor)
- Automatic restart thermal protection on R6150J-2, R6125-2, R6335A-2, R6325A-2
- Aluminum cover, impeller, and housing
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AE133
- Inlet filter AJ126F (pressure)
- Vacuum gauge AE134
- Inline filter AJ151G (vacuum)
- Muffler AJ121F
- Relief valve AG258
- Liquid separator RMS300 (vacuum)
- Foam replacement kit K904

Product Dimensions (inches, mm)

Note: Unit must be mounted horizontally, foot pad down



MODEL	L (in)	L (mm)
R6125-2	16.45	418
R6325A-2	15.53	394
R6135J-10	15.86	403
R6335A-2	16.59	421
R6335B	16.00	406
R6150J-2	17.46	443
R6350A-2 R6350B-2	17.35	441

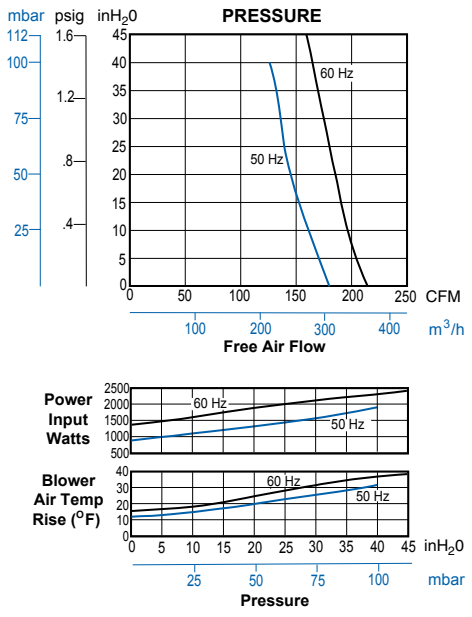
Product Specifications

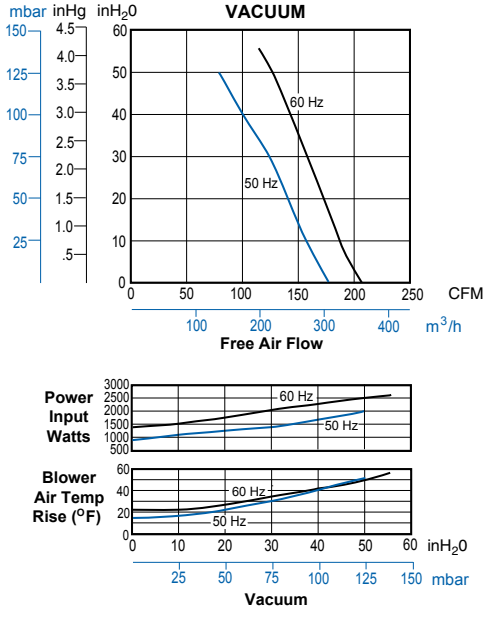
MODEL NUMBER		R6125-2	R6325A-2	R6135J-10	R6335A-2
Motor Enclosure		TEFC	TEFC	ODP	TEFC
HP/kW	60 Hz	2.5/1,9	2.5/1,9	3.5/2,6	3.5/2,6
	50 Hz	1.5/1,1	1.85/1,38	-	2.5/1,9
Voltage	60 Hz	115/208-230-1	208-230/460-3	230-1	208-230/460-3
	50 Hz	110/220-240-1	190-220/380-415-3	-	190-220/380-415-3
Amps	60 Hz	22/12.5-11	6.9-6.9/3.45	19	9.7-8.8/4.4
	50 Hz	18/9.5	6.6-6.7/3.3-3.5	-	8.8/4-3.9
Starting Amps	60 Hz	58 @ 230V	58 @ 230V	125 @ 230V	50 @ 460V
	50 Hz	42 @ 240V	23.5 @ 380V	-	40.5 @ 380V
Insulation Class		F	B	F	F
Recommended NEMA Starter Size		1/0	0/00	1P	1/0
Net Weight (lbs/kg)		87/39,5	76/34,5	112/50,8	82/37,2

MODEL NUMBER		R6335B	R6150J-2	R6350A-2	R6350B-2
Motor Enclosure		TEFC	ODP	TEFC	TEFC
HP/kW	60 Hz	3.5/2,6	5.0/3,7	5.0/3,7	5.0/3,7
	50 Hz	-	-	4.8/3,6	-
Voltage	60 Hz	575-3	230-1	208-230/460-3	575-3
	50 Hz	-	-	190-220/380-415-3	-
Amps	60 Hz	3.6	22.3	13.0-12.0/6.0	4.8
	50 Hz	-	-	14.4-13.4/7.2-6.8	-
Starting Amps	60 Hz	34.9 @ 575V	96 @ 230V	125 @ 230V	35 @ 575V
	50 Hz	-	-	57 @ 380V	-
Insulation Class		F	F	F	F
Recommended NEMA Starter Size		0	1P	1/0	0
Net Weight (lbs/kg)		82/37,2	125/56,8	112/50,8	112/50,8

Product Performance

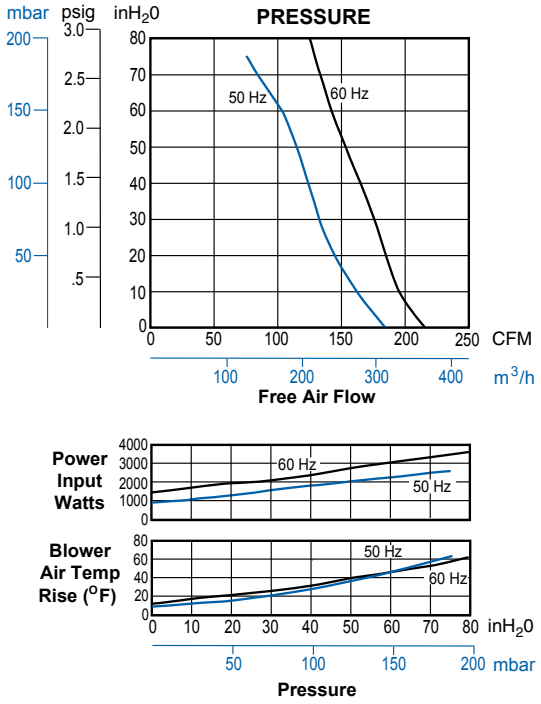
Models R6125-2, R6325A-2

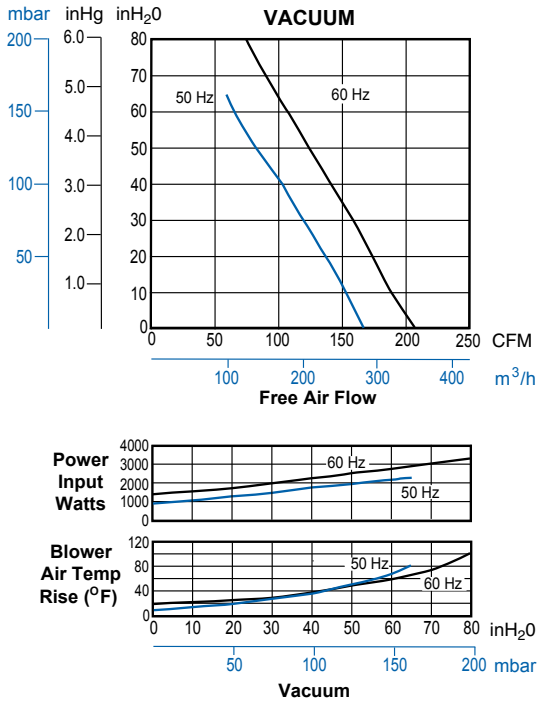




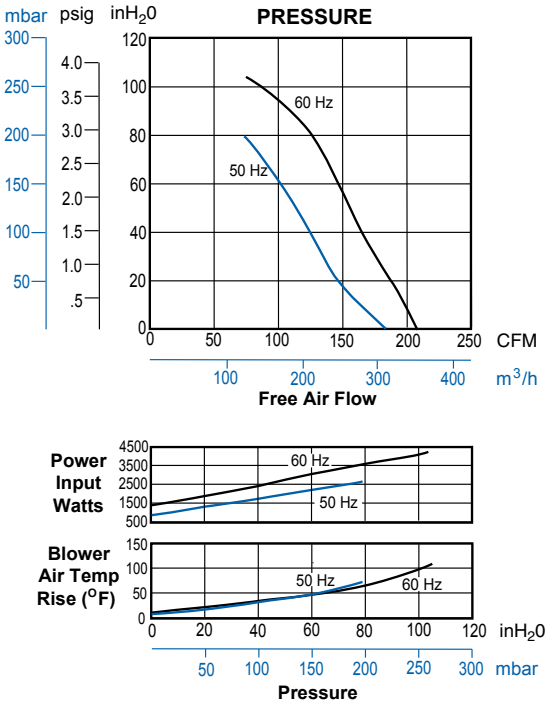
Product Performance

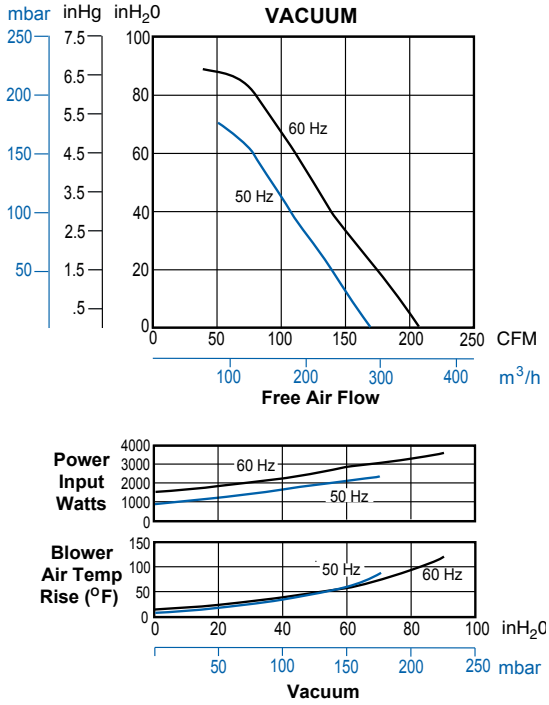
Models R6135J-10, R6335A-2, R6335B





Models R6150J-2, R6350A-2, R6350B-2





Models R6P335A, R6P350A, R6P350B, R6P355A

Maximum pressure, vacuum, and air flow varies for the r6p series, depending on the model(s). Reference the chart for the specific model performance.

PRODUCT FEATURES

- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings
- Aluminum cover, impeller, and housing
- Inlet and outlet have internal muffling

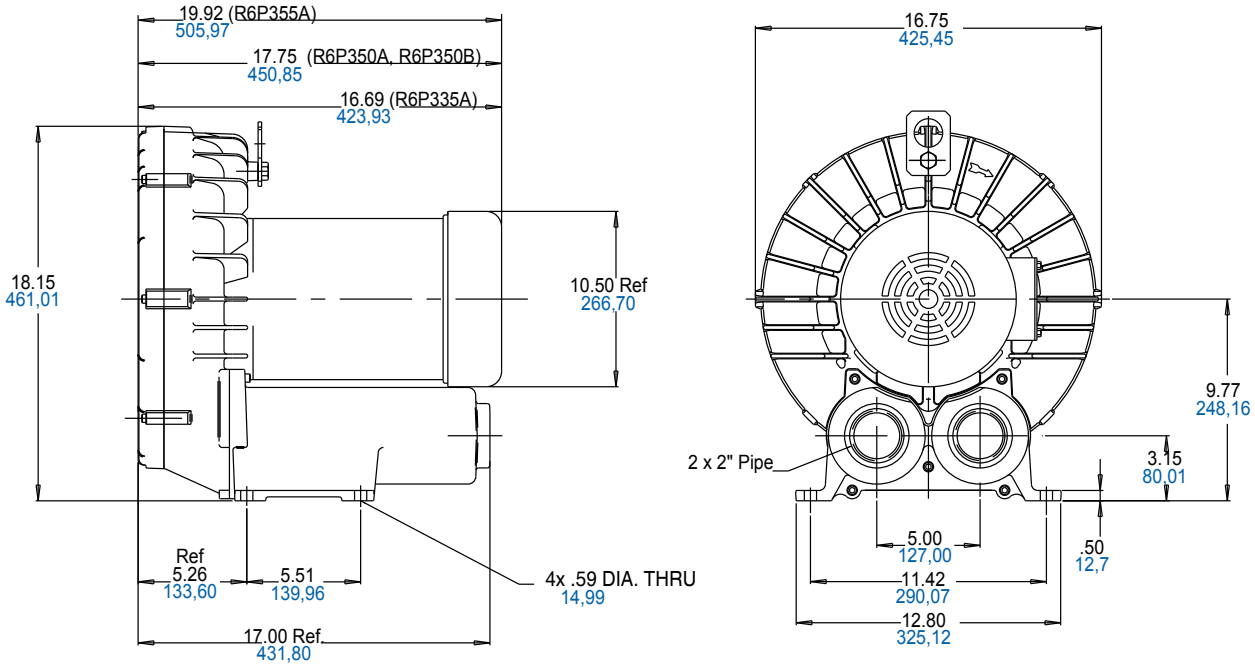
RECOMMENDED ACCESSORIES

- Pressure gauge AE133
- Inlet filter AJ126F (pressure)
- Vacuum gauge AE134
- Inline filter AJ151G (vacuum)
- Muffler AJ121F
- Relief valve AG258
- Liquid separator RMS300 (vacuum)
- Foam replacement kit K907

MODELS	Maximum Pressure (inH_2O) 60 Hz	50 Hz	Maximum Vacuum (inH_2O) 60 Hz	50 Hz	Maximum Air Flow (CFM) 60 Hz	50 Hz
R6P335A	30	50	35	60	265	230
R6P350A R6P350B	60	70	70	70	290	245
R6P355A	110	85	90	70	265	225

Product Dimensions (inches, mm)

Note: Unit must be mounted horizontally, foot pad down

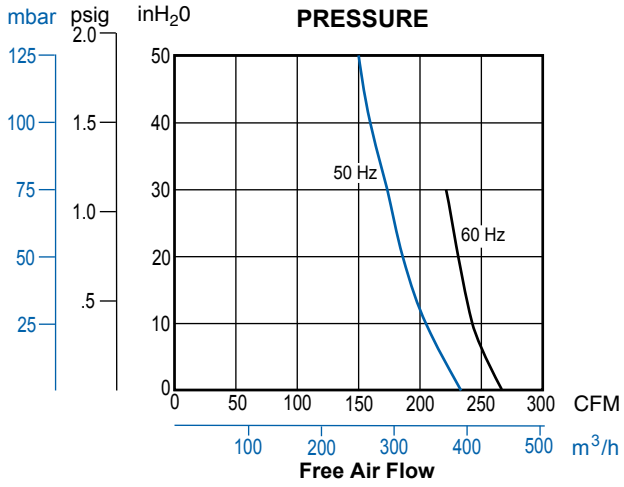


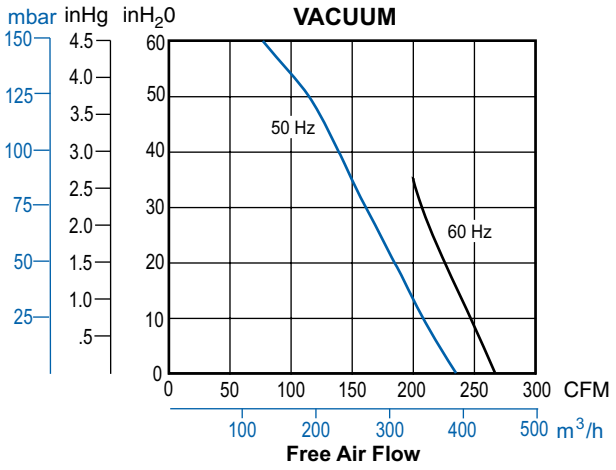
Product Specifications

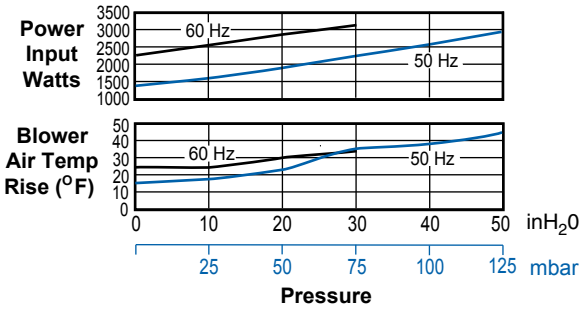
MODEL NUMBER		R6P335A	R6P350A	R6P350B	R6P355A
Motor Enclosure		TEFC	TEFC	TEFC	TEFC
HP/kW	60 Hz	3.5/2,6	5.0/3,7	5.0/3,7	5.5/4,1
	50 Hz	2.5/1,9	4.8/3,6	-	5.0/3,7
Voltage	60 Hz	208-230/460-3	208-230/460-3	575-3	208-230/460-3
	50 Hz	190-220/380-415-3	190-220/380-415-3	-	190-220/380-415-3
Amps	60 Hz	9.7-8.8/4.4	13.0-12.0/6.0	4.8	19.5-18.2/9.1
	50 Hz	8-8/4-3.9	14.4-13.4/7.2-6.8	-	14.2-13.4/7.1
Starting Amps	60 Hz	50 @ 460V	125 @ 230V	35 @ 575V	83 @ 460V
	50 Hz	40.5 @ 380V	57 @ 380V	-	72 @ 380V
Insulation Class		F	F	F	F
Recommended NEMA Starter Size		1/0	1/0	0	1/0
Net Weight (lbs/kg)		150/68	176/80	176/80	215/98

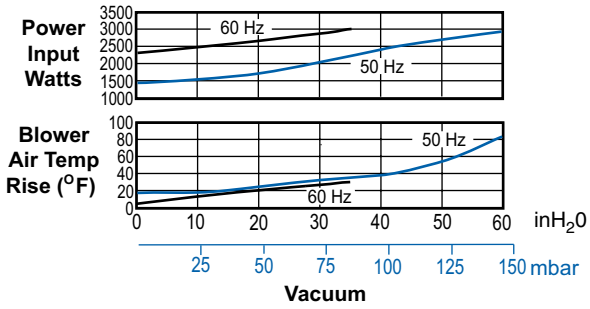
Product Performance

Model R6P335A



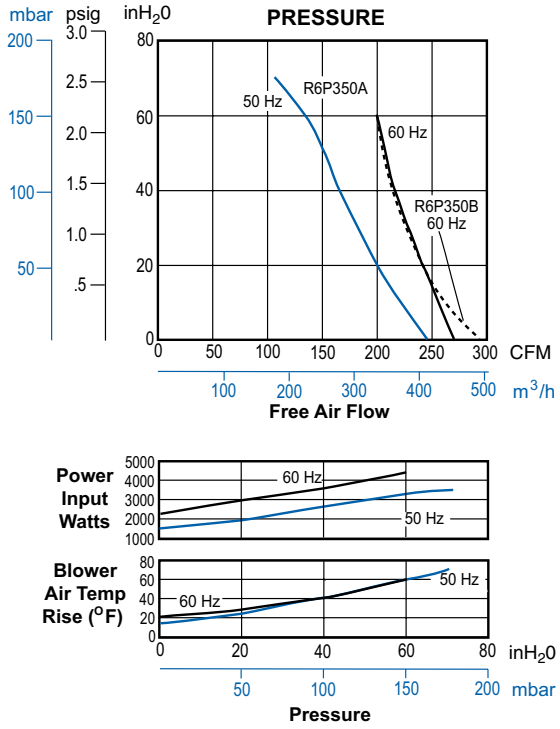


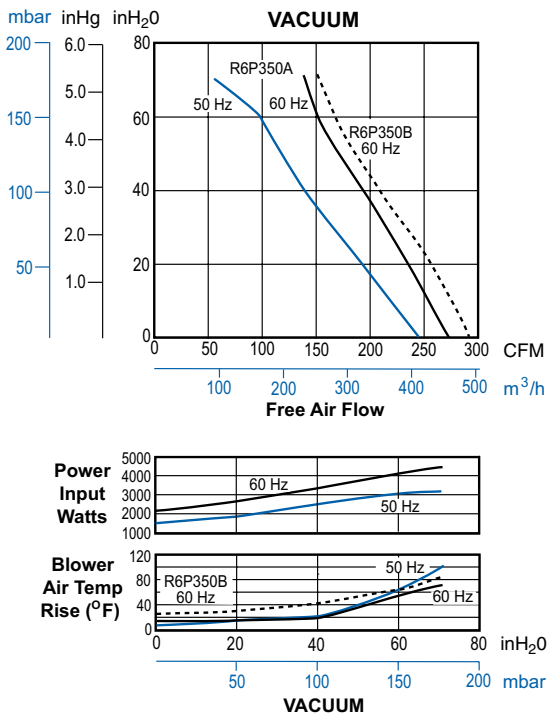




Product Performance

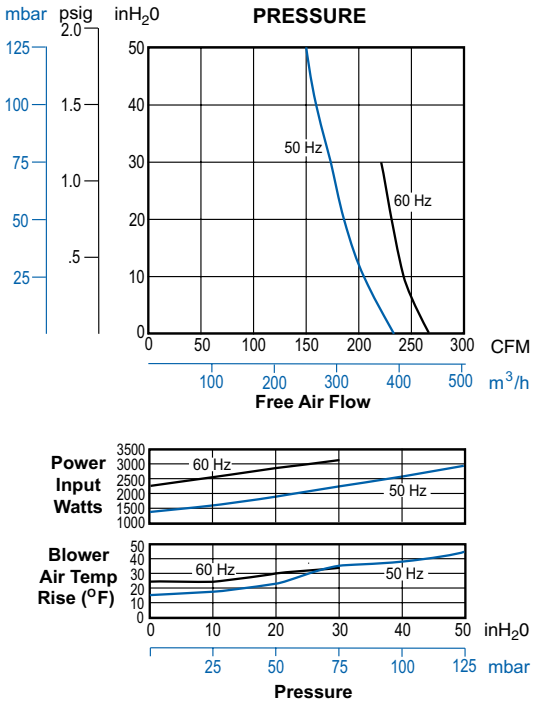
Models R6P350A, R6P350B

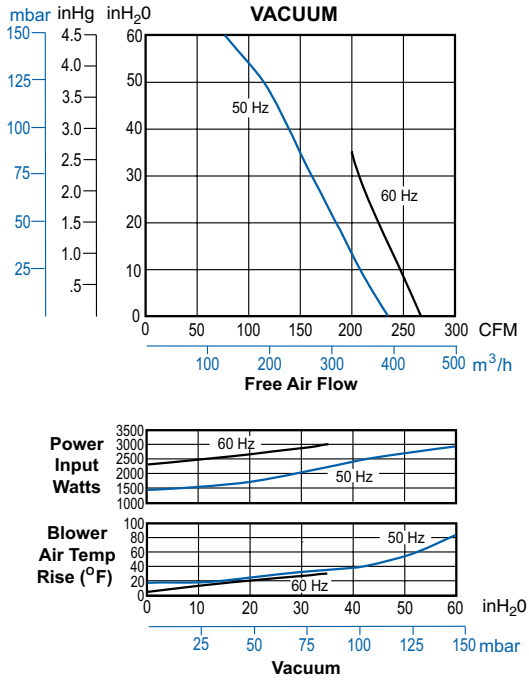




Product Performance

Model R6P355A





Models R6PP3110M (Parallel)

Max. pressure – 95 inH_2O (60 Hz), 75 inH_2O (50 Hz)
Max. vacuum – 80 inH_2O (60 Hz), 65 inH_2O (50 Hz)
Max. air flow – 520 CFM (60 Hz), 420 CFM (50 Hz)

PRODUCT FEATURES

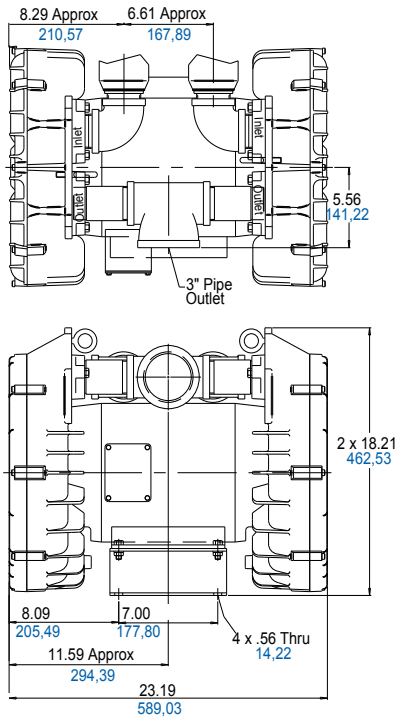
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved motors with permanently sealed ball bearings
- Class F insulation on motors
- Aluminum impeller; cast iron cover and housing
- Includes (2) muffler AJ121F
- Smaller and less costly than two motor-mounted units

RECOMMENDED ACCESSORIES

- Pressure gauge AE133
- Inlet Filter AJ126F (pressure), use (2)
- Vacuum gauge AE134
- Inline filter AJ151H (vacuum)
- Relief valve AG258F
- Liquid separator RMS400 (vacuum)
- Muffler AJ121H (for exhaust)

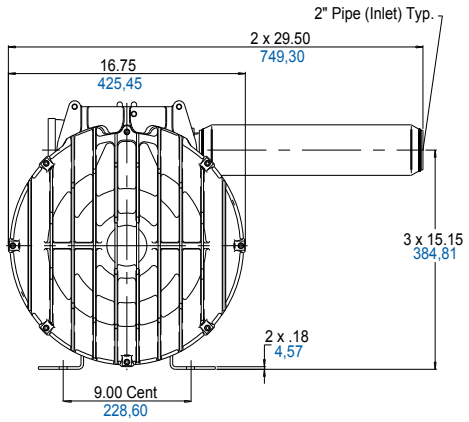
Product Dimensions (inches, mm)

TOP VIEW



Note: Unit must be mounted with shaft horizontal.

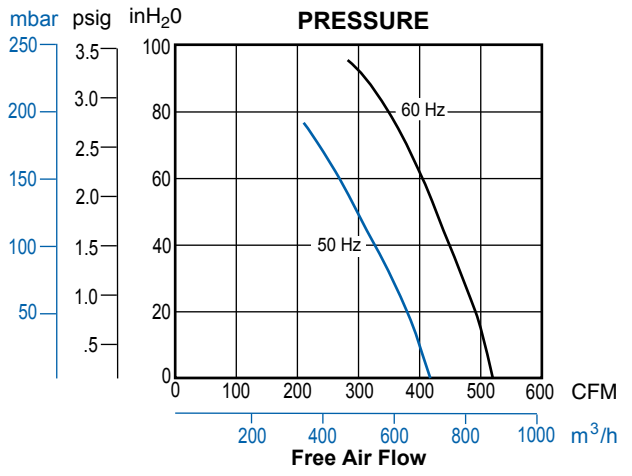
Note: Unit is stocked with plumbing arrangement of parallel compressor. The end user may reverse intake and exhaust plumbing or tie the inlets together with 2” pipe to make a vacuum unit.

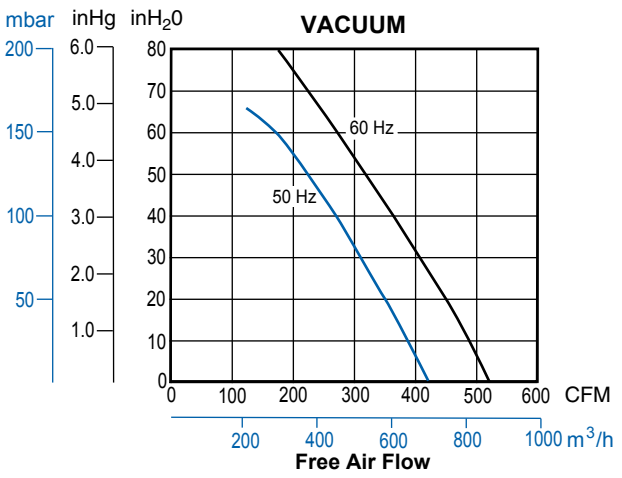


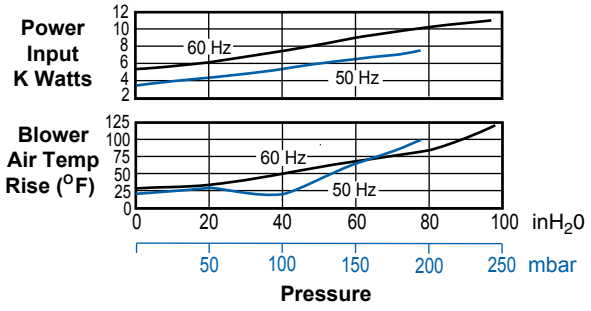
Product Specifications

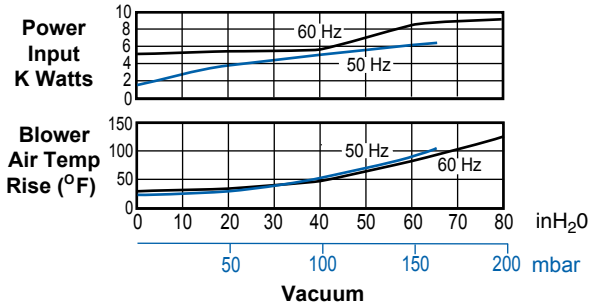
MODEL NUMBER		R6PP3110M
Motor Enclosure		ODP
HP/kW	60 Hz	11/8,2
	50 Hz	7/5,2
Voltage	60 Hz	208-230/460-3
	50 Hz	220/380-415-3
Amps	60 Hz	36-35/17.5
	50 Hz	32/15.5-13
Starting Amps	60 Hz	181 @ 460V
	50 Hz	176 @ 380V
Insulation Class		F
Recommended NEMA Starter Size		2/2
Net Weight (lbs/kg)		309/140

Product Performance









Models R7100A-3, R7100B-1

Max. pressure – 125 inH_2O (60 Hz), 115 inH_2O (50 Hz)
Max. vacuum – 110 inH_2O (60 Hz), 90 inH_2O (50 Hz)
Max. air flow – 420 CFM (60 Hz), 350 CFM (50 Hz)

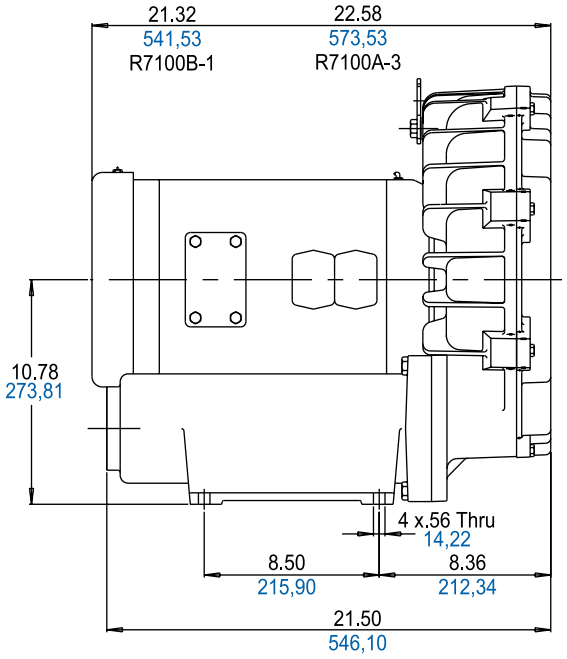
PRODUCT FEATURES

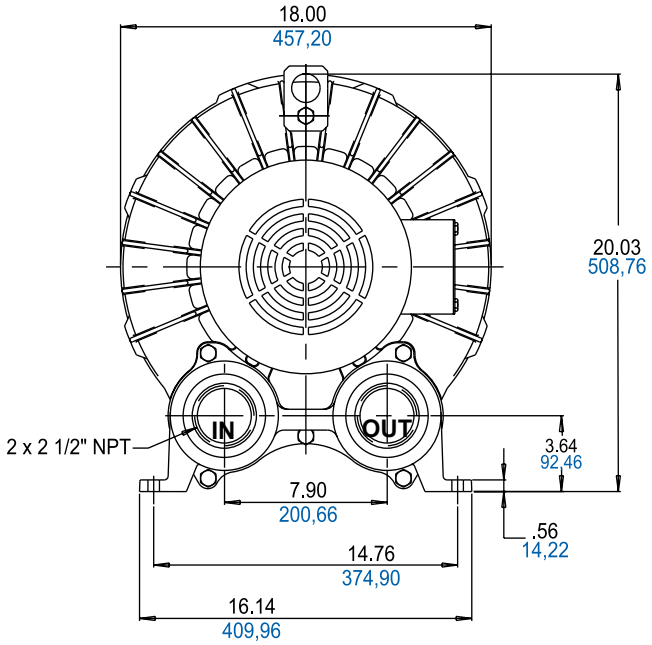
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motors with permanently sealed ball bearings
- IP54 rated enclosure on motors
- Aluminum impeller; cast iron cover and housing
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AE133A
- Inlet filter AJ126G (pressure)
- Vacuum gauge AE134
- Vacuum gauge for monitoring inlet filter restriction AJ497
- Pressure/vacuum relief valve AG258
- Silencer for vacuum relief valve AJ121D
- Inline filter AJ151H (vacuum)
- External muffler for additional silencing AJ121G
- Liquid separator RMS400 (vacuum)
- Foam replacement kit K827

Product Dimensions (inches, mm)

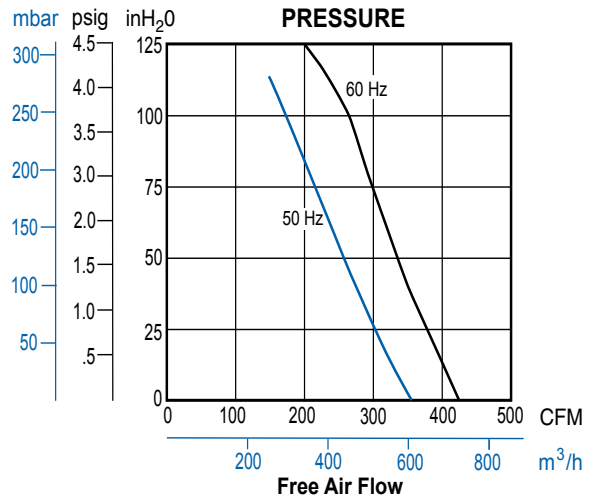


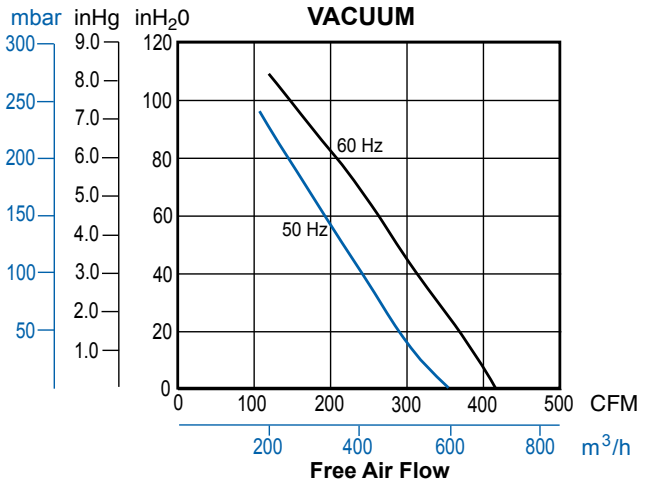


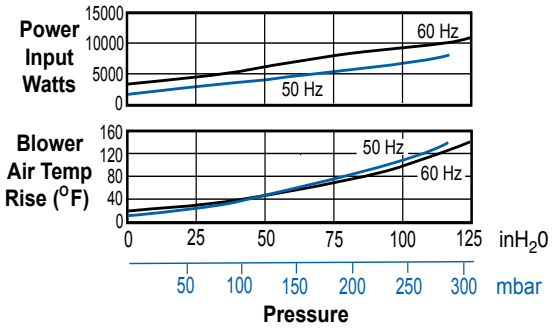
Product Specifications

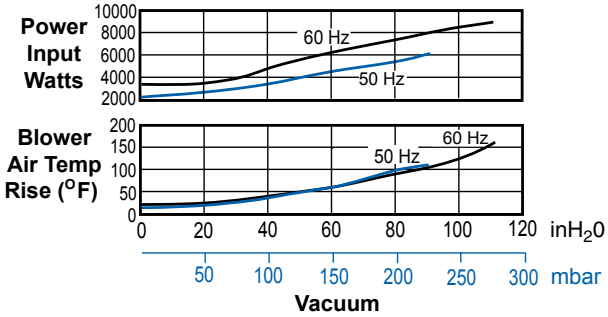
MODEL NUMBER		R7100A-3	R7100B-1
Motor Enclosure		TEFC	TEFC
HP/kW	60 Hz	10/7,5	10/7,5
	50 Hz	8/6	-
Voltage	60 Hz	208-230/460-3	575-3
	50 Hz	190-220/380-440-3	-
Amps	60 Hz	35-29.5/15	9.6
	50 Hz	27-23/13.5-12.3	-
Starting Amps	60 Hz	120 @ 460V	84 @ 575V
	50 Hz	143 @ 380V	-
Insulation Class		F	F
Recommended NEMA Starter Size		2/1	1
Net Weight (lbs/kg)		293/133	290/131

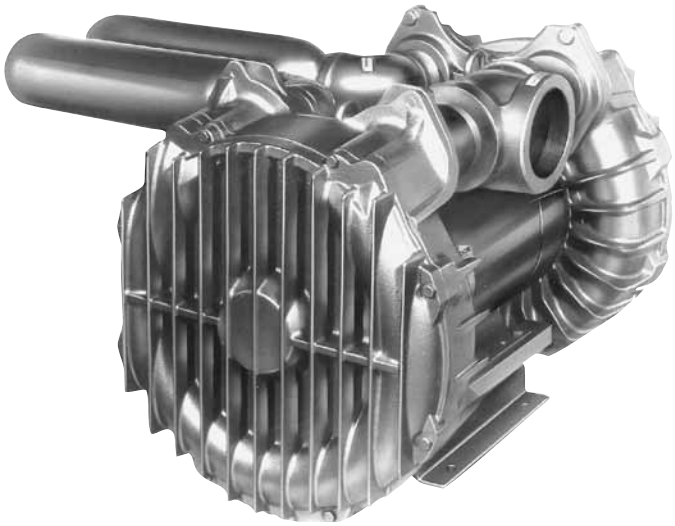
Product Performance











Model R7P3180M (parallel)

Max. pressure – 105 inH_2O (60 Hz), 90 inH_2O (50 Hz)
Max. vacuum – 95 inH_2O (60 Hz), 85 inH_2O (50 Hz)
Max. air flow – 795 CFM (60 Hz), 666 CFM (50 Hz)

PRODUCT FEATURES

- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved motor with permanently sealed ball bearings
- Cast iron blower housing and cover. Cast aluminum impeller
- Smaller and less costly than two blowers
- Includes external mufflers for additional silencing AJ121M (2)

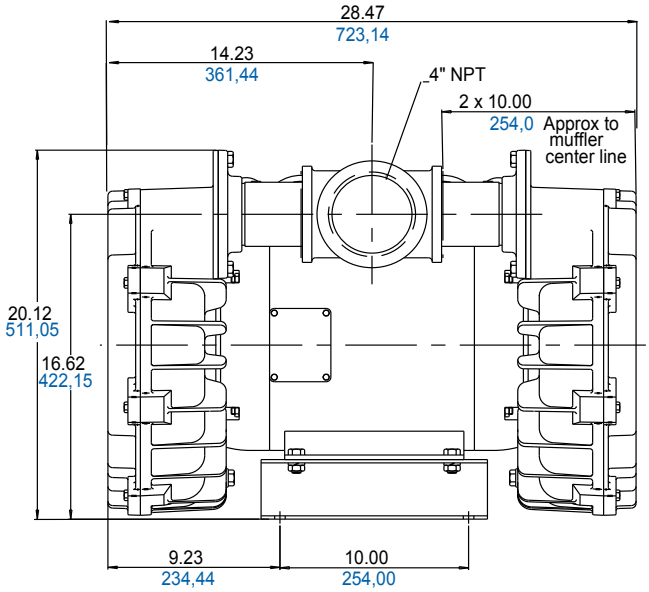
RECOMMENDED ACCESSORIES

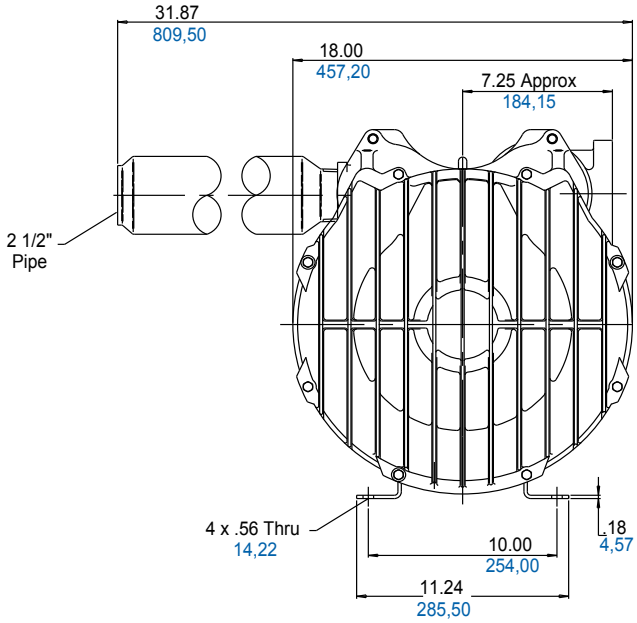
- Pressure gauge AE133
- Two inlet filters AJ126G (pressure)
- Vacuum gauge AE134
- Vacuum gauge for monitoring inlet filter restriction AJ497
- Pressure/vacuum relief valve AG258F
- Silencer for vacuum relief valve AJ121G
- Inline filter AJ151M (vacuum)
- Liquid separator RMS400 (for vacuum line)

Product Dimensions (inches, mm)

Note: Unit must be mounted with shaft horizontal.

Note: Unit is stocked with plumbing arrangement of parallel compressor.
The end user may reverse intake and exhaust plumbing to make a vacuum unit.

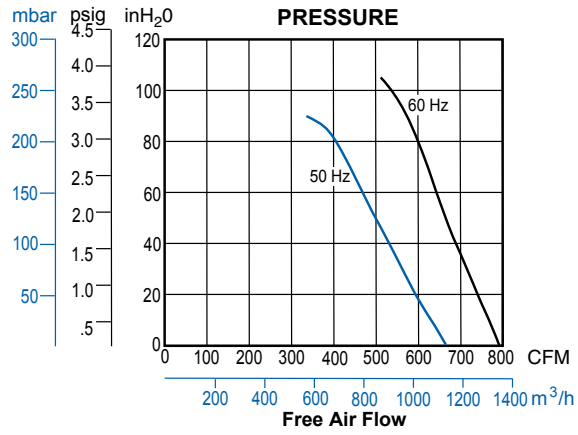


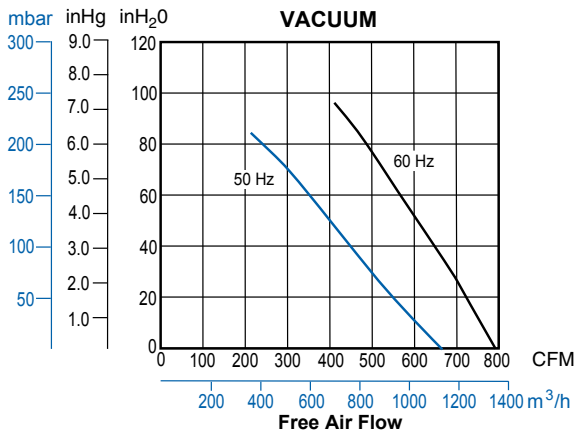


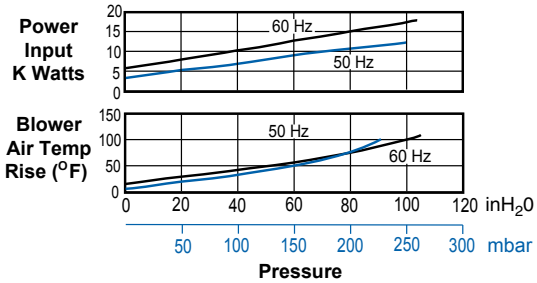
Product Specifications

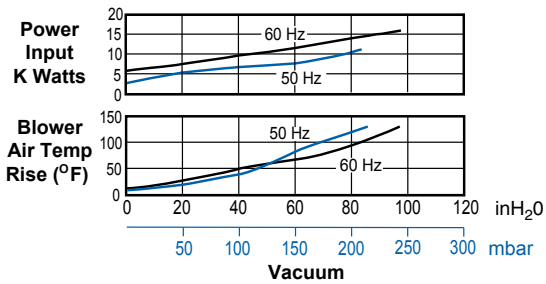
MODEL NUMBER		R7P3180M
Motor Enclosure		ODP
HP/kW	60 Hz	18/13,4
	50 Hz	12/9
Voltage	60 Hz	230/460-3
	50 Hz	190-220/380-440-3
Amps	60 Hz	52/26
	50 Hz	52-45/26-23
Starting Amps	60 Hz	238 @ 460V
	50 Hz	Consult Factory
Insulation Class		F
Recommended NEMA Starter Size		3/2
Net Weight (lbs/kg)		438/198

Product Performance









Model R93150A

Max. pressure – 125 inH_2O (60 Hz), 125 inH_2O (50 Hz)
Max. vacuum – 115 inH_2O (60 Hz), 105 inH_2O (50 Hz)
Max. air flow – 680 CFM (60 Hz), 585 CFM (50 Hz)

PRODUCT FEATURES

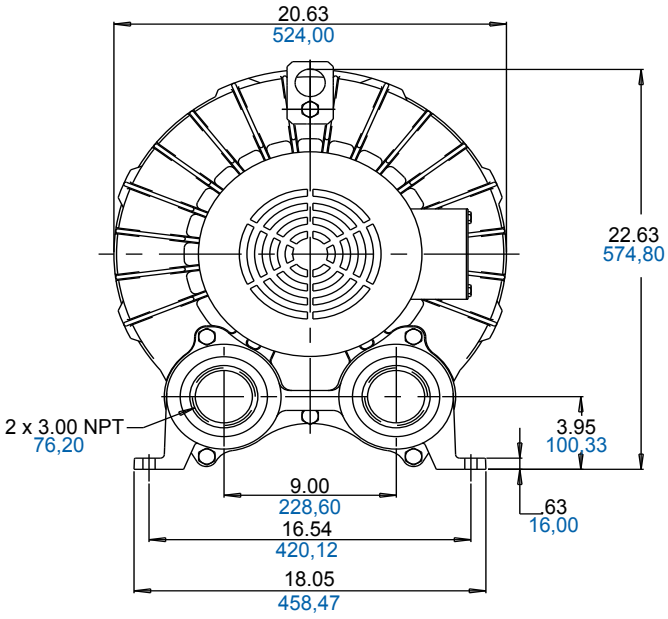
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motor with permanently sealed ball bearings
- IP54 rated enclosure on motors
- Cast iron housing, cover, and muffler enclosure.
- Cast aluminum impeller
- Inlet and outlet have internal muffling

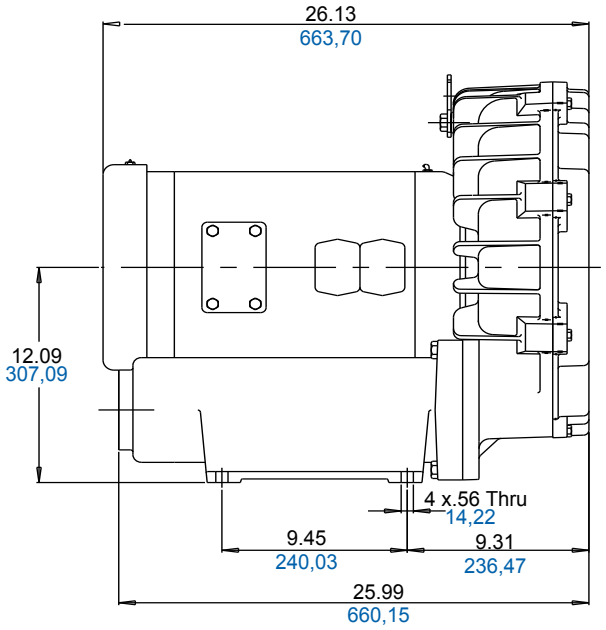
RECOMMENDED ACCESSORIES

- Pressure gauge AE133
- Inlet filter AJ126M (pressure)
- Vacuum gauge AE134
- Vacuum gauge for monitoring inlet filter restriction AJ497
- Pressure/vacuum relief valve AG258F
- Silencer for vacuum relief valve AJ121G
- Inline filter AJ151M (vacuum)
- External muffler for additional silencing AJ121H
- Foam replacement kit K829

Product Dimensions (inches, mm)

Note: Unit must be mounted with shaft horizontal.

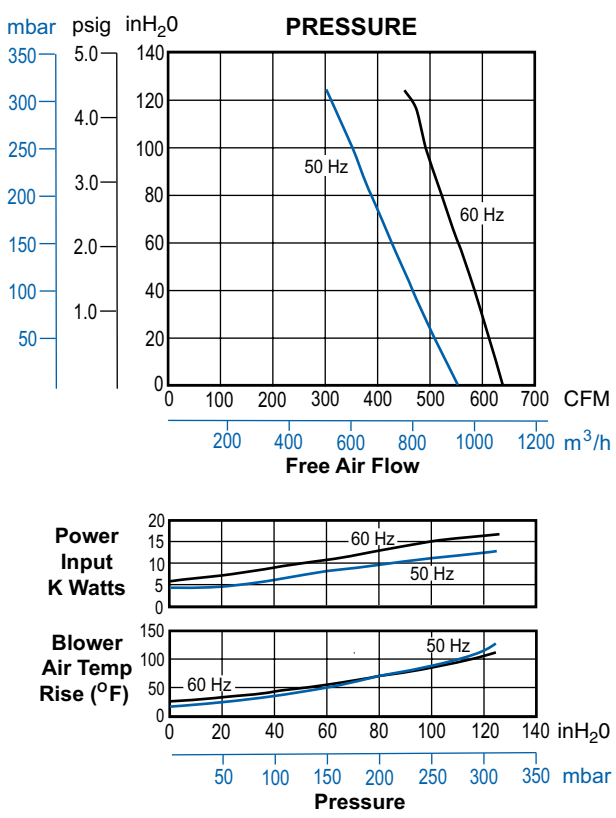


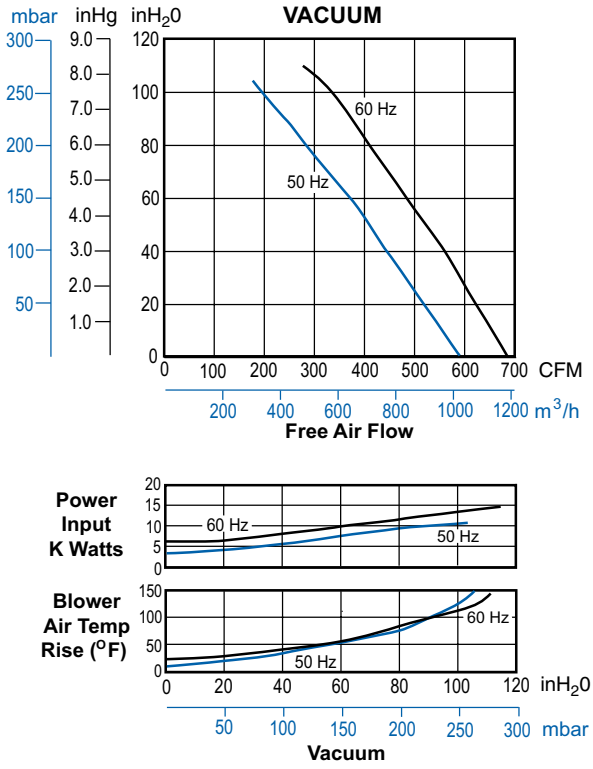


Product Specifications

MODEL NUMBER		R93150A
Motor Enclosure		TEFC
HP/kW	60 Hz	15/11,1
	50 Hz	10/7,5
Voltage	60 Hz	208-230/460-3
	50 Hz	190-220/380-440-3
Amps	60 Hz	50-50/25
	50 Hz	46-42/23-21
Starting Amps	60 Hz	173 @ 460V
	50 Hz	185 @ 440V
Insulation Class		F
Recommended NEMA Starter Size		2/2
Net Weight (lbs/kg)		452/204

Product Performance





Model R9P3300M

Max. pressure – 125 inH_2O (60 Hz), 110 inH_2O (50 Hz)
Max. vacuum – 110 inH_2O (60 Hz), 100 inH_2O (50 Hz)
Max. air flow – 1350 CFM (60 Hz), 1140 CFM (50 Hz)

PRODUCT FEATURES

- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved ODP motor with permanently sealed ball bearings
- Cast iron blower housing and covers. Cast aluminum impellers
- Smaller and less costly than two motor-mounted units
- Includes external mufflers for additional silencing AJ121H (2)

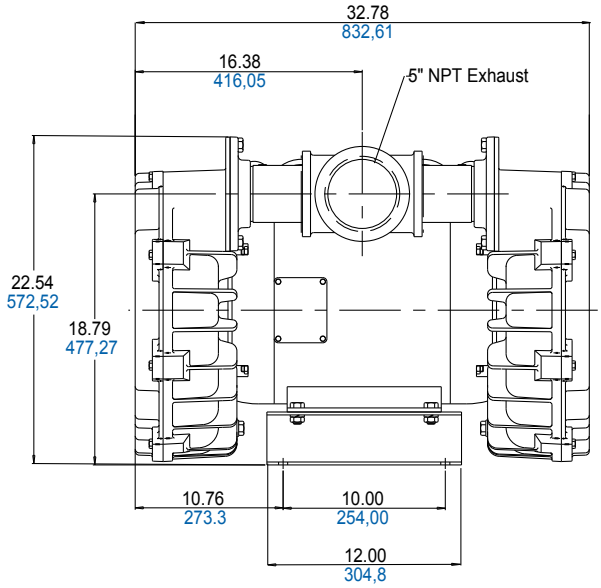
RECOMMENDED ACCESSORIES

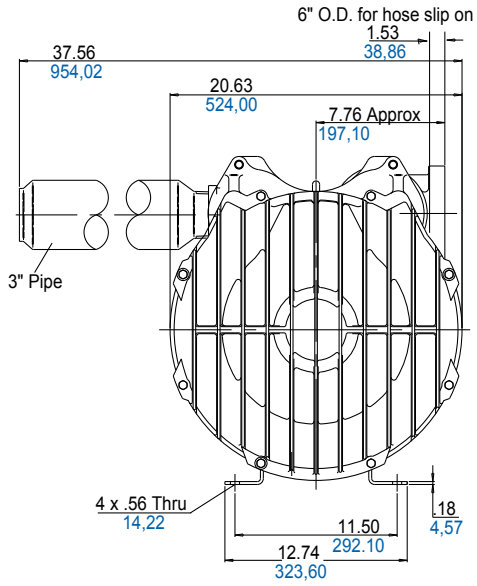
- Pressure gauge AE133
- Two inlet filters AJ126M (pressure)
- Vacuum gauge AE134
- Vacuum gauge for monitoring inlet filter restriction AJ497
- Two pressure/vacuum relief valves AG258F mounted in customer supplied plumbing
- Silencer for each vacuum relief valve AJ121G
- External muffler for additional silencing AJ121N
- Two inline filters (vacuum) AJ151M mounted in parallel in customer provided plumbing

Product Dimensions (inches, mm)

Note: Unit must be mounted with shaft horizontal.

Note: Unit is stocked with plumbing arrangement of parallel compressor.
End user may reverse intake and exhaust plumbing to make a vacuum unit.

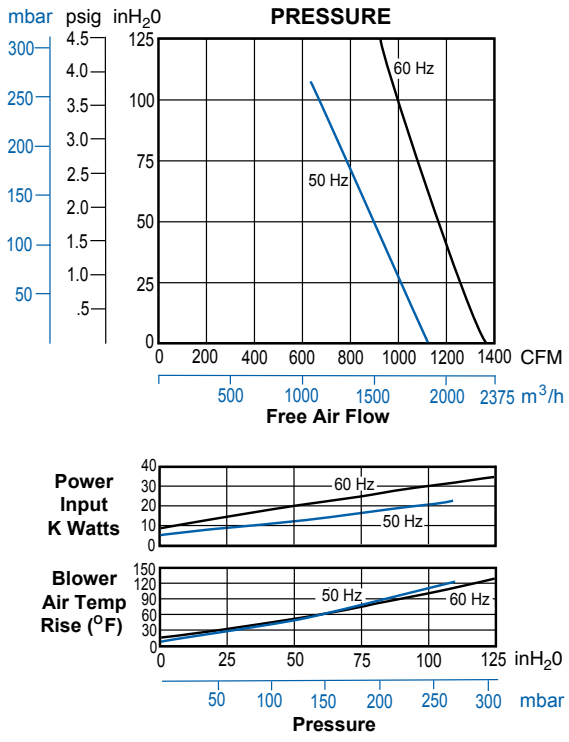


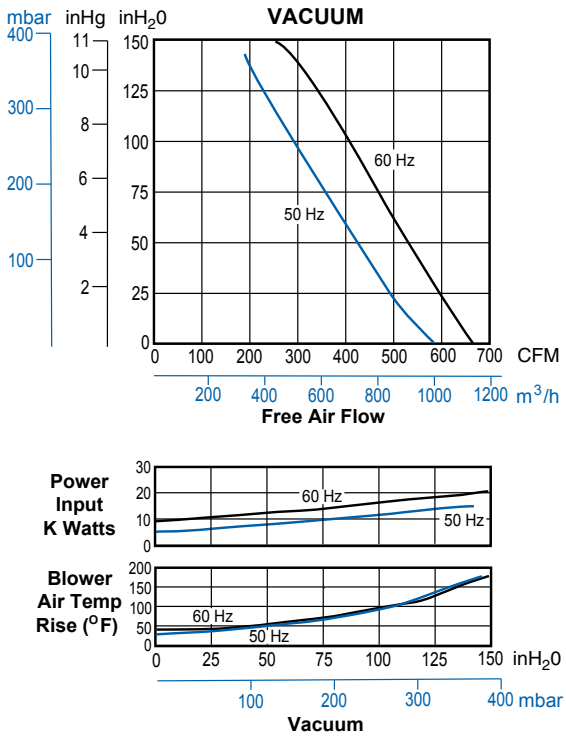


Product Specifications

MODEL NUMBER		R9P3300M
Motor Enclosure		ODP
HP/kW	60 Hz	30/22,3
	50 Hz	19/14,1
Voltage	60 Hz	230/460-3
	50 Hz	190-220/380-440-3
Amps	60 Hz	78/39
	50 Hz	76-70/38-35
Starting Amps	60 Hz	280 @ 460V
	50 Hz	185 @ 440V
Insulation Class		F
Recommended NEMA Starter Size		3/3
Net Weight (lbs/kg)		622/327

Product Performance





High Pressure Models

Models R4H3060A

Max. pressure – 284 inH_2O (60 Hz), 284 inH_2O (50 Hz)
Max. vacuum – 183 inH_2O (60 Hz), 183 inH_2O (50 Hz)
Max. air flow – 128 CFM (60 Hz), 107 CFM (50 Hz)

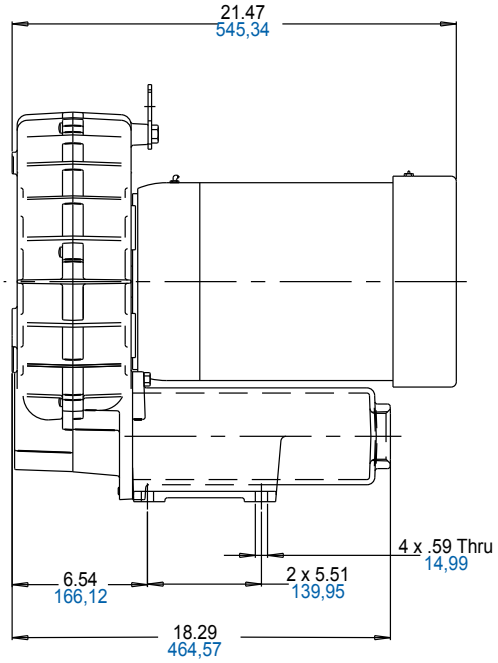
PRODUCT FEATURES

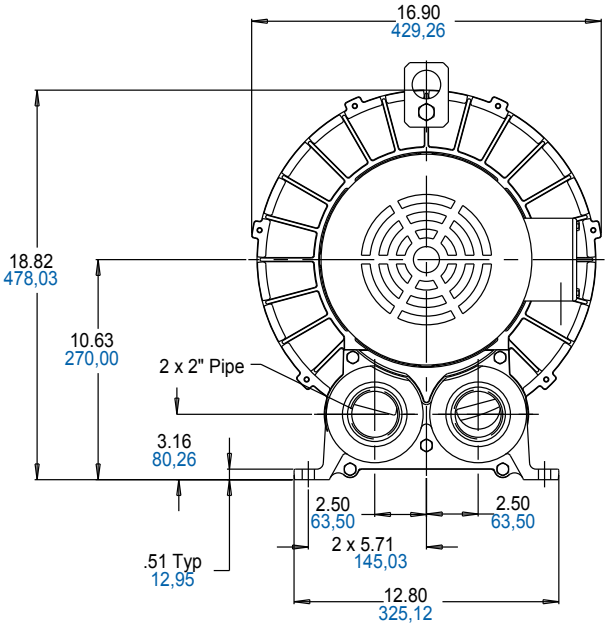
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motor with permanently sealed ball bearings
- IP54 rated enclosure on motors
- Cast aluminum dual impeller, blower housing, and cover
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Pressure gauge AE133F
- Inlet filter AJ126D (pressure)
- Pressure relief valve PV102 (60Hz), PV098 (50Hz)
- Vacuum gauge AE134F
- Vacuum gauge for monitoring inlet filter restriction AJ497
- Vacuum relief valve AG258
- Silencer for vacuum relief valve AJ121D
- Inline filter AJ151E (vacuum)
- External muffler for additional silencing AJ121F
- Foam replacement kit K905

Product Dimensions (inches, mm)

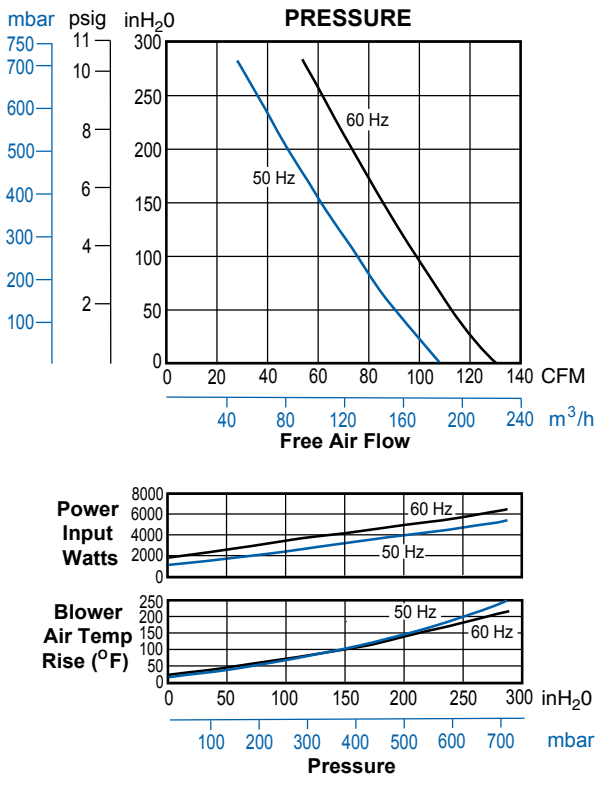


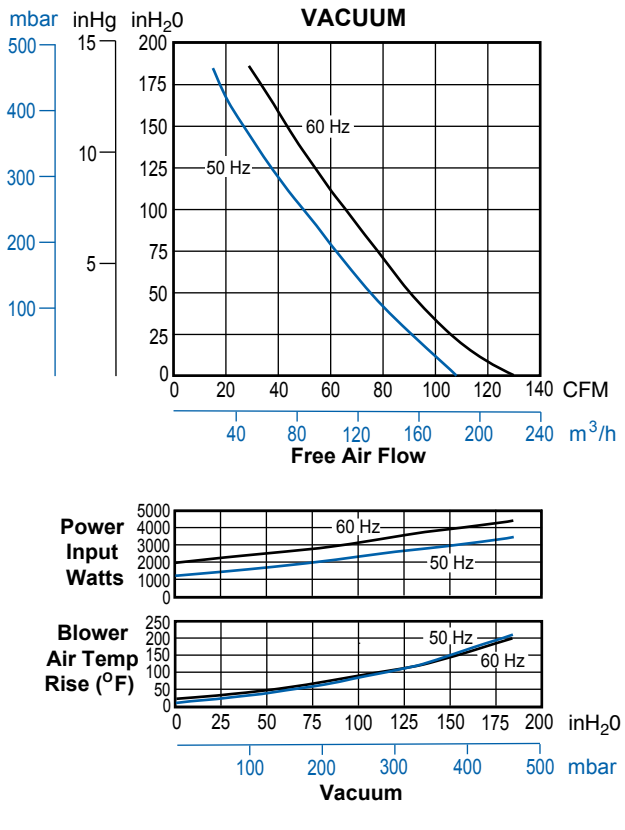


Product Specifications

MODEL NUMBER		R4H3060A	R4H3060B
Motor Enclosure		TEFC	TEFC
HP/kW	60 Hz	6/4.4	6/4,4
	50 Hz	5/3.7	-
Voltage	60 Hz	208-230/460-3	575-3
	50 Hz	190-220/380-440-3	-
Amps	60 Hz	19.5-18.2/9.1	7.3
	50 Hz	16.8-16.0/8.4-8.0	-
Starting Amps	60 Hz	83 @ 460V	67 @ 575V
	50 Hz	72 @ 380V	-
Insulation Class		F	F
Recommended NEMA Starter Size		1/0	0
Net Weight (lbs/kg)		200/91	200/91

Product Performance





High Pressure Models

Model R4H3060A-1 (vacuum only)

Max. vacuum – 204 inH_2O (60 Hz), 176 inH_2O (50 Hz)
Max. air flow – 121 CFM (60 Hz), 101 CFM (50 Hz)

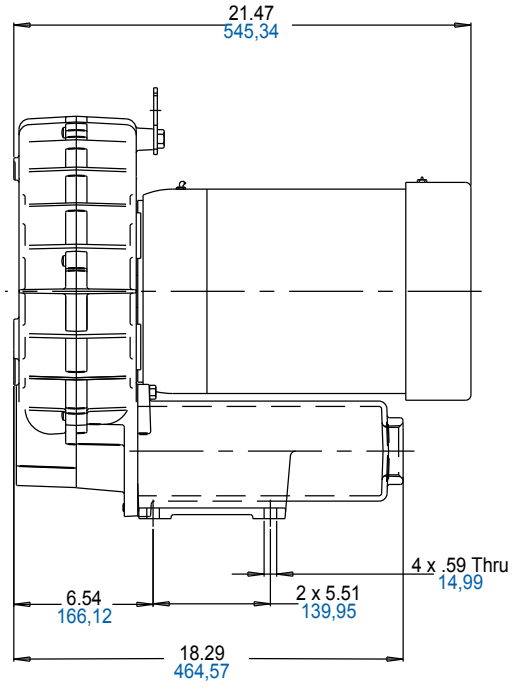
PRODUCT FEATURES

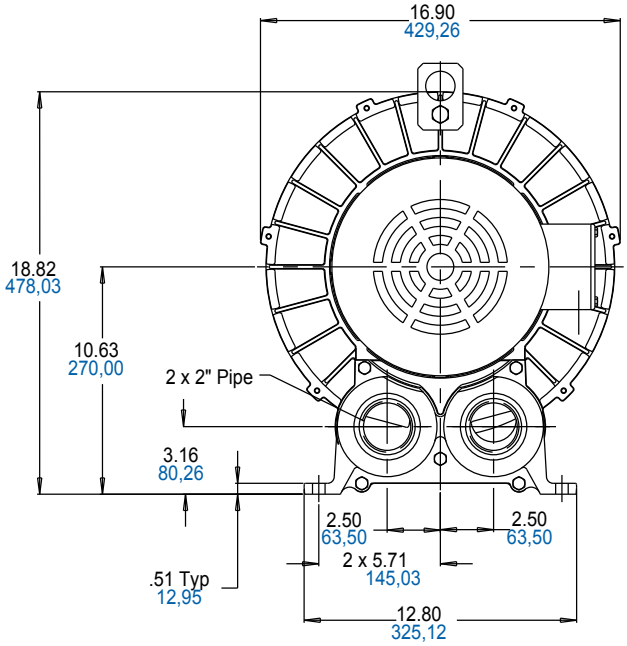
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved TEFC motor with permanently sealed ball bearings
- IP54 rated enclosure on motors
- Cast aluminum dual impeller, blower housing, and cover
- Can be mounted in any plane
- Inlet and outlet have internal muffling

RECOMMENDED ACCESSORIES

- Vacuum gauge AE134F
- Vacuum relief valve AG258
- Silencer for vacuum relief valve AJ121D
- Inline filter AJ151E (vacuum)
- External muffler for additional silencing AJ121F

Product Dimensions (inches, mm)

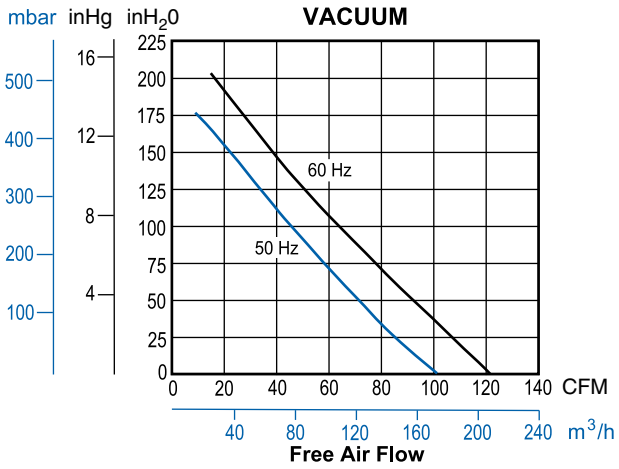


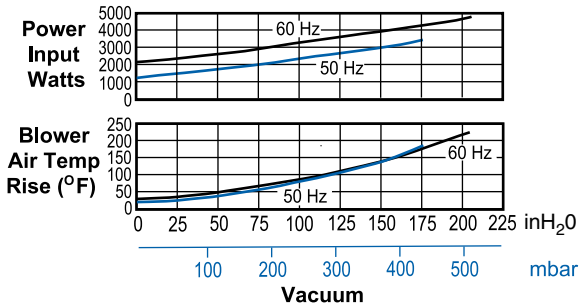


Product Specifications

MODEL NUMBER		R4H3060A-1
Motor Enclosure		TEFC
HP/kW	60 Hz	6/4,5
	50 Hz	5/3,7
Voltage	60 Hz	208-230/460-3
	50 Hz	190-220/380-440-3
Amps	60 Hz	19.5-18.2/9.1
	50 Hz	16.8-16.0/8.4-8.0
Starting Amps	60 Hz	83 @ 460V
	50 Hz	72 @ 380V
Insulation Class		F
Recommended NEMA Starter Size		1/0
Net Weight (lbs/kg)		200/91

Product Performance





High Pressure Models

Model R6PS3110M (staged)

Max. pressure – 170 inH_2O (60 Hz),145 inH_2O (50 Hz)
Max. vacuum – 130 inH_2O (60 Hz),110 inH_2O (50 Hz)
Max. air flow – 280 CFM (60 Hz), 230 CFM (50 Hz)

PRODUCT FEATURES

- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved motor with permanently sealed ball bearings
- Aluminum impeller; cast iron cover and housing
- Includes muffler AJ121F
- Smaller and less costly than two motor-mounted units

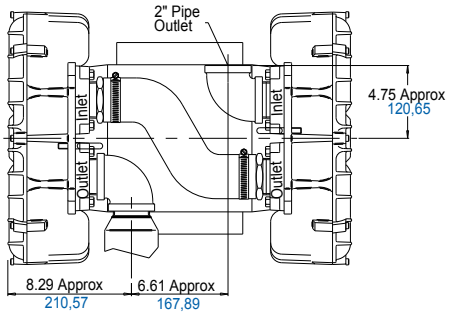
RECOMMENDED ACCESSORIES

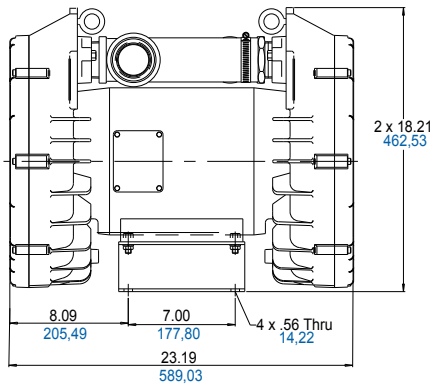
- Pressure gauge AE133A
- Inlet filter AJ126F (pressure)
- Vacuum gauge AE134
- Inline filter AJ151H (vacuum)
- Relief valve AG258
- Liquid separator RMS300 (vacuum)

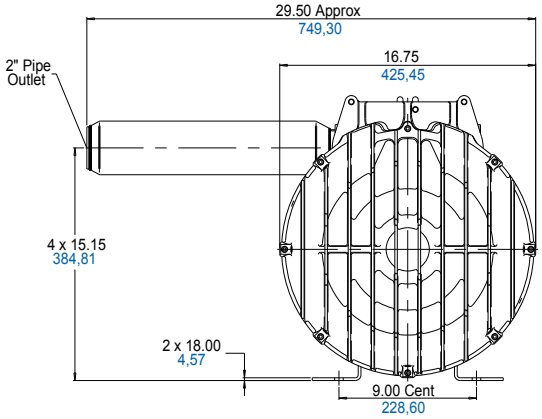
Product Dimensions (inches, mm)

Note: Unit must be mounted with shaft horizontal.

TOP VIEW



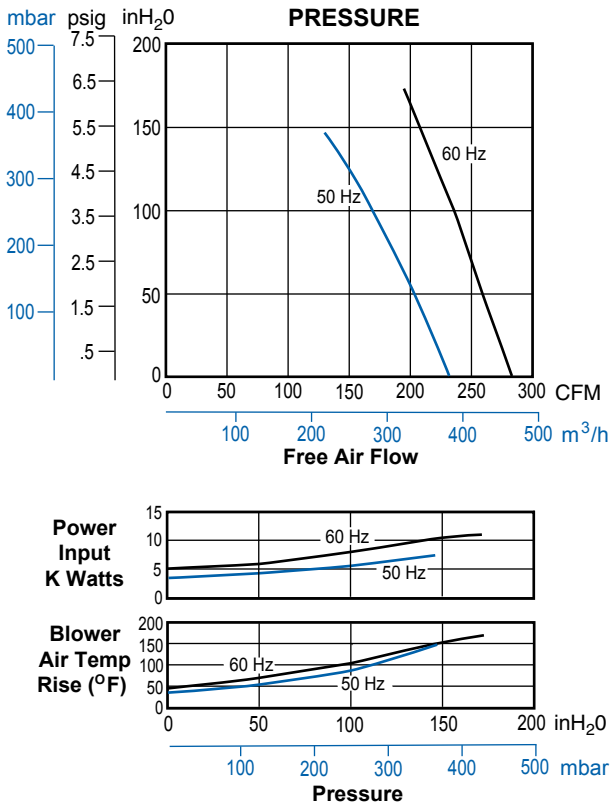


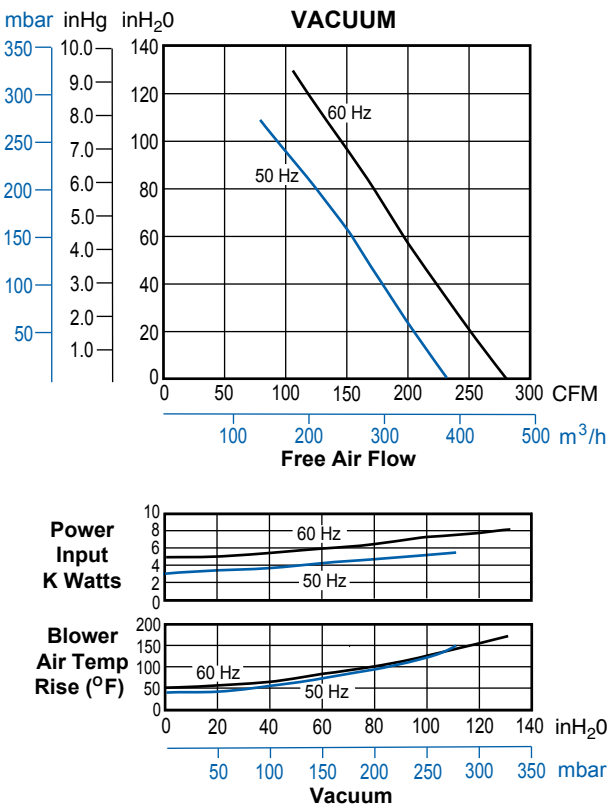


Product Specifications

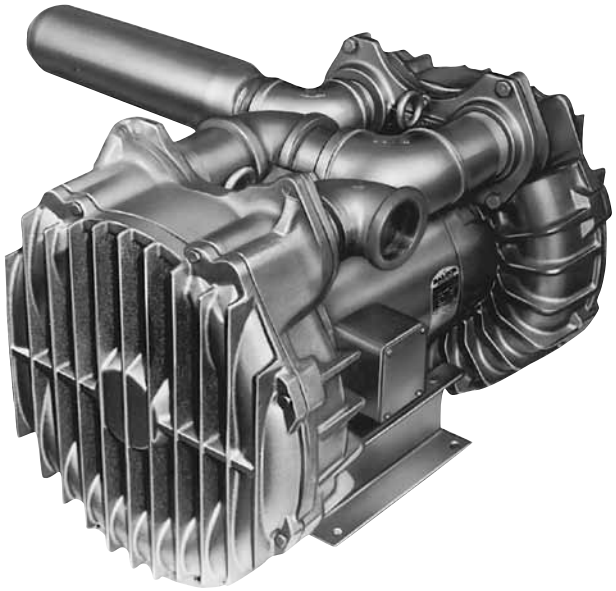
MODEL NUMBER		R6PS3110M
Motor Enclosure		OPEN
HP/kW	60 Hz	11/8,2
	50 Hz	7/5,2
Voltage	60 Hz	208-230/460-3
	50 Hz	220/380-415-3
Amps	60 Hz	36-35/17.5
	50 Hz	32/15.5-13
Starting Amps	60 Hz	181 @ 460V
	50 Hz	176 @ 380V
Insulation Class		F
Recommended NEMA Starter Size		2/2
Net Weight (lbs/kg)		309/140

Product Performance





High Pressure Models



Model R7S3180M (staged)

Max. pressure – 200 inH_2O (60 Hz), 170 inH_2O (50 Hz)
Max. vacuum – 150 inH_2O (60 Hz), 130 inH_2O (50 Hz)
Max. air flow – 430 CFM (60 Hz), 350 CFM (50 Hz)

PRODUCT FEATURES

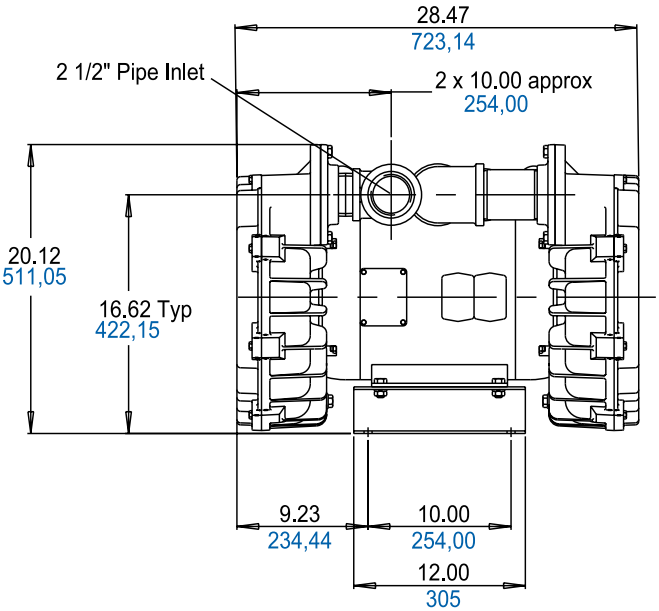
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved motor with permanently sealed ball bearings
- Cast iron blower housing and cover. Cast aluminum impeller
- Includes external muffler for additional silencing AJ121G

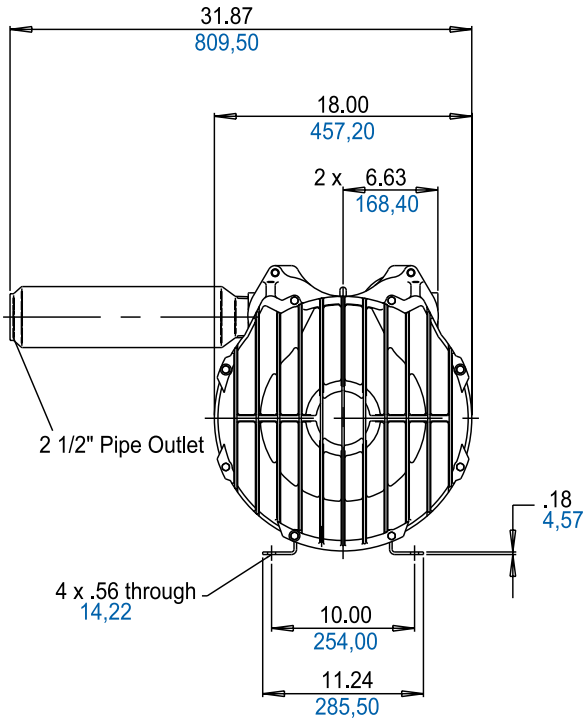
RECOMMENDED ACCESSORIES

- Pressure gauge AE133A
- Inlet filter AJ126G (pressure)
- Vacuum gauge AE134
- Vacuum gauge for monitoring inlet filter restriction AJ497
- Pressure/vacuum relief valve AG258F
- Silencer for vacuum relief valve AJ121G
- Inline filter AJ151H (vacuum)
- Liquid separator RMS400 (for vacuum line)

Product Dimensions (inches, mm)

Note: Unit must be mounted with shaft horizontal

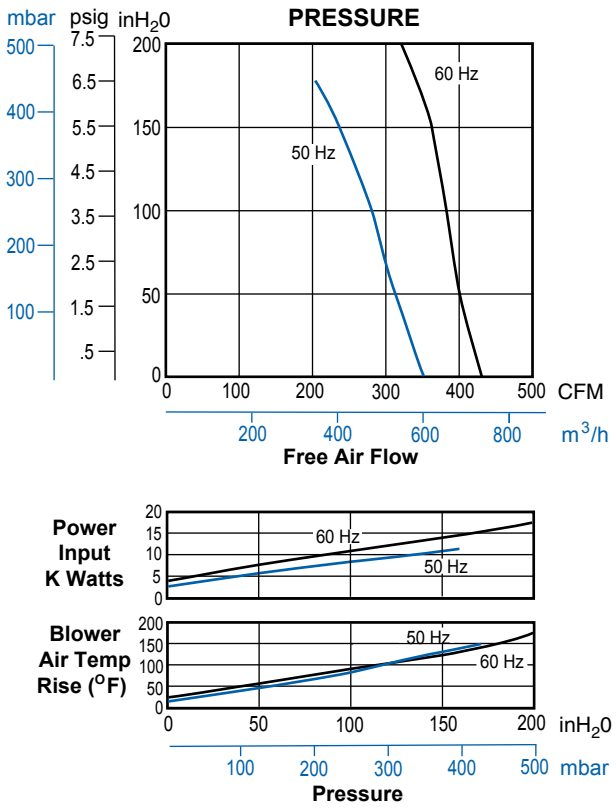


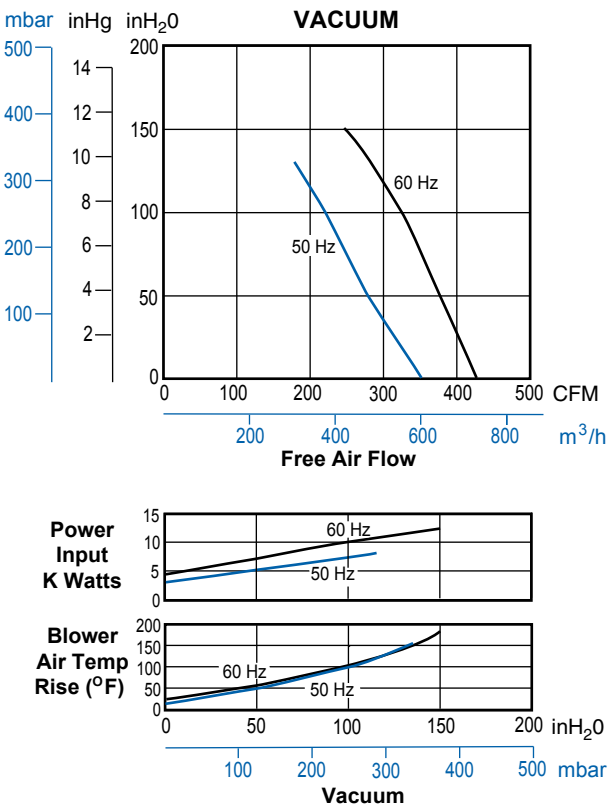


Product Specifications

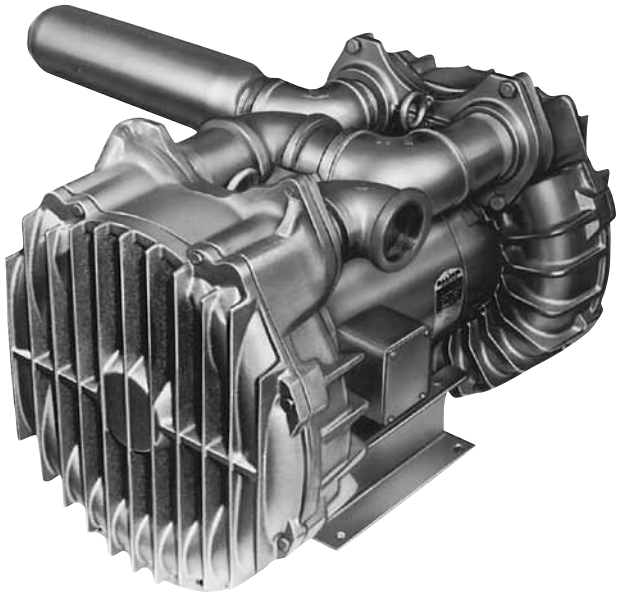
MODEL NUMBER		R7S3180M
Motor Enclosure		ODP
HP/kW	60 Hz	18/13,4
	50 Hz	12/9
Voltage	60 Hz	230/460-3
	50 Hz	190-220/380-440-3
Amps	60 Hz	52/26
	50 Hz	52-45/26-23
Starting Amps	60 Hz	238 @ 460V
	50 Hz	Consult Factory
Insulation Class		F
Recommended NEMA Starter Size		3/2
Net Weight (lbs/kg)		431/195,7

Product Performance





High Pressure Models



Model R9S3300M

Max. pressure – 222 inH_2O (60 Hz), 208 inH_2O (50 Hz)
Max. vacuum – 149 inH_2O (60 Hz), 142 inH_2O (50 Hz)
Max. air flow – 660 CFM (60 Hz), 585 CFM (50 Hz)

PRODUCT FEATURES

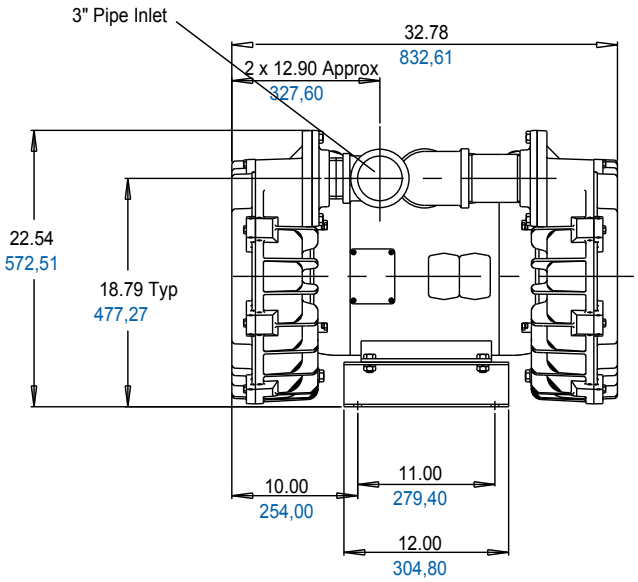
- Rugged construction, low maintenance
- Oilless operation
- UL and CSA approved motor with permanently sealed ball bearings
- Cast iron housing, cover and muffler enclosure. Cast aluminum impeller
- External muffler for additional silencing AJ121H
- Smaller and less costly than two motor-mounted units

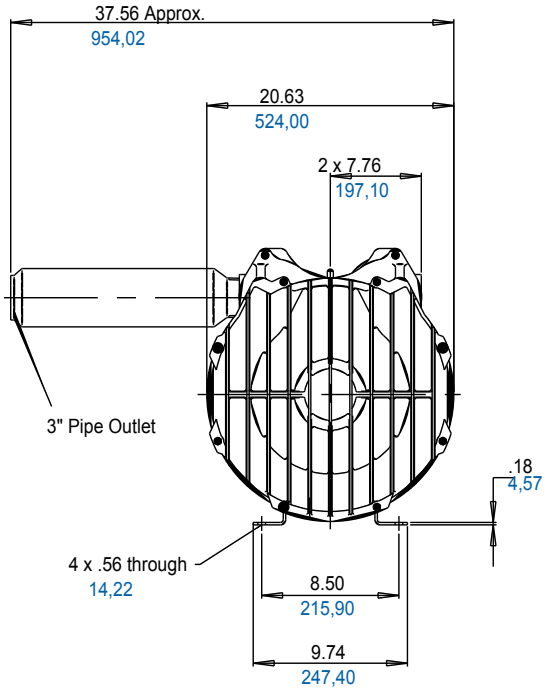
RECOMMENDED ACCESSORIES

- Pressure gauge AE133F
- Inlet filter AJ126M (pressure)
- Vacuum gauge AE134
- Vacuum gauge for monitoring inlet filter restriction AJ497
- Pressure/vacuum relief valve AG258F
- Silencer for vacuum relief valve AJ121G
- Inline filter AJ151M (vacuum)

Product Dimensions (inches, mm)

Note: Unit must be mounted with shaft horizontal

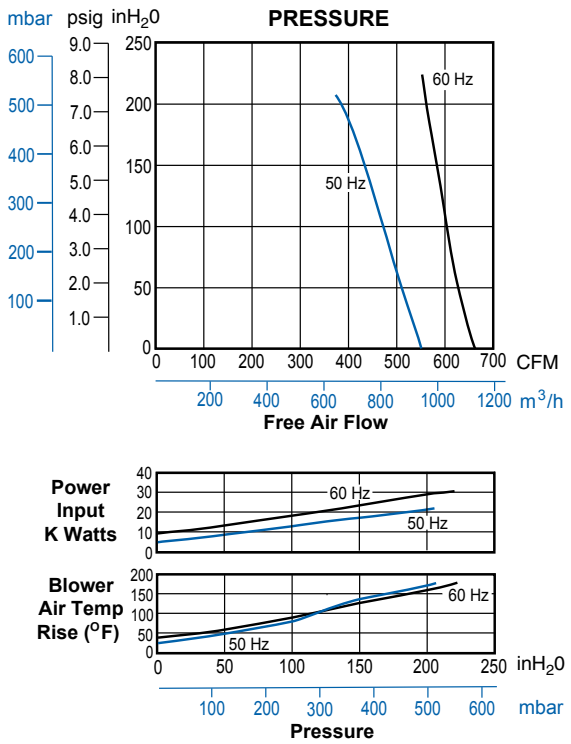


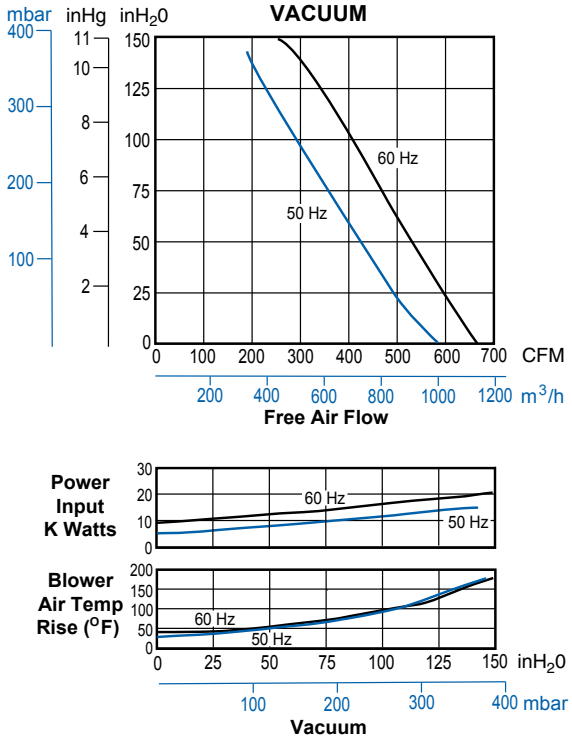


Product Specifications

MODEL NUMBER		R9S3300M
Motor Enclosure		ODP
HP/kW	60 Hz	30/22,3
	50 Hz	19/14,3
Voltage	60 Hz	230/460-3
	50 Hz	190-220/380-440-3
Amps	60 Hz	98/49
	50 Hz	82-47/41-39
Starting Amps	60 Hz	320 @ 460V
	50 Hz	308 @ 440V
Insulation Class		F
Recommended NEMA Starter Size		3/3
Net Weight (lbs/kg)		606,275

Product Performance





R3105N-50

R4 - R7 Series

Explosion Proof Motors

MODELS	Maximum Pressure (inH_2O) 60 Hz	50 Hz	Maximum Vacuum (inH_2O) 60 Hz	50 Hz	Maximum Air Flow (CFM) 60 Hz	50 Hz
R3105N-50	43	31	40	28	53	44
R4110N-50 R4310P-50	51	38	48	35	92	74
R4P115N-50	65	45	60	40	133	112
R5125Q-50	55	—	60	—	160	—
R5325R-50	65	50	65	47	160	133
R6130Q-50	60	75	70	65	215	180
R6340R-50	100	75	80	65	215	180
R6P155Q-50	95	80	85	65	280	235
R6P355R-50	100	80	85	65	280	232
R7100R-50	100	90	110	85	425	350

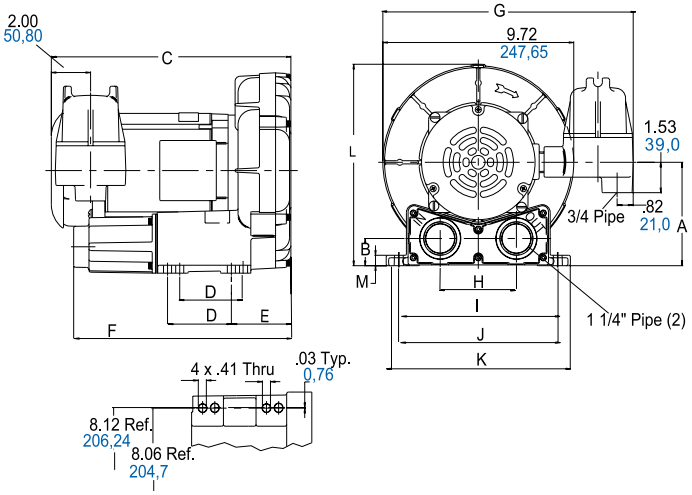
PRODUCT FEATURES

- Rugged design, maintenance free
- Quiet operation within OSHA standards
- Blowers and motors rated for continuous duty
- UL and CSA approved multi-voltage motors, incorporating approved thermal protection
- Motors classified as Explosion Proof Division 1 and 2, for Group D explosive atmospheres
- Motors carry full rated load at temperatures below Class B motor insulation limits
- Class F motor insulation used in motors larger than 1 HP
- Motors conform to NEMA frame sizes; motor enclosures conform to IP54 (suitable for outdoor use)
- Pilot duty thermal overload protection is standard on all 1 HP and larger motors
- Double sealed motor ball bearings with a B10 life exceeding 30,000 hours of continuous operation at the maximum rated continuous blower load
- Sealed air streams
- Aluminum impeller, housing, and cover; viton shaft seal
- Pressurized and leak-tested to less than 5 cc/minute

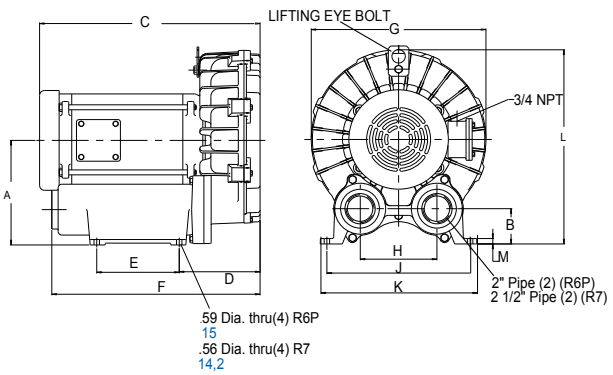
Recommended Accessories	R3 Series	R4 Series	R4P Series	R5 Series	R6 Series	R6P Series	R7 Series
Pressure Gauge	AJ496	AJ496	AE133	AE133	AE133	AE133	AE133
Vacuum Gauge	AJ497	AJ497	AE134	AE134	AE134	AE134	AE134
Pressure Filter	AJ126C	AJ126D	AJ126D	AJ126D	AJ126F	AJ126F	AJ126G
Vacuum Filter (Inline)	AJ151C	AJ151D	AJ151D	AJ151E	AJ151G	AJ151G	AJ151H

Product Dimensions (inches, mm)

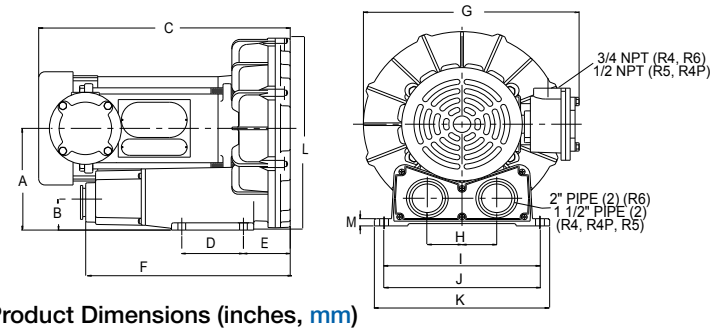
Model R3



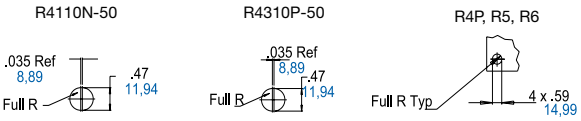
Models R6P, R7



Models R4, R4P, R5, R6



Mounting Hole Detail



Product Dimensions (inches, mm)

Model	A	B	C	D	E	F	G	H	I	J	K	L	M
R3105N-50	5.21	1.37	12.3	3.25	3.06	11.06	12.75	3.88	8.06	8.12	9.38	10.15	.53
	132	35	312	83	78	281	324	99	205	206	238	258	13
R4110N-50	6.18	1.68	15.34	3.75	2.85	12.44	12.34	3.96	8.86	8.93	10.00	11.80	.44
	157	43	390	95	72	316	313	101	225	227	254	300	11
R4310P-50	6.18	1.68	14.09	3.75	2.84	12.44	12.34	3.96	8.86	8.93	10.00	11.80	.44
	157	43	358	95	74	316	313	101	225	227	254	300	11
R4P115N-50	6.98	1.84	17.41	4.50	3.25	13.93	13.75	4.75	10.25	10.31	11.75	13.61	.60
	177	47	442	114	83	354	349	121	260	262	298	346	15
R5125Q-50	7.02	1.82	17.59	4.50	3.55	14.22	13.72	4.75	10.25	10.31	11.75	13.80	.59
	178	46	447	114	90	361	348	121	260	262	298	351	15
R5325R-50	7.02	1.82	16.75	4.50	3.55	14.22	13.56	4.75	10.25	10.31	11.75	13.80	.59
	178	46	1425	114	90	361	344	121	260	262	298	351	15
R6130Q-50	7.75	1.94	18.97	5.50	3.85	16.02	15.17	4.92	11.38	11.42	12.96	15.34	.52
	197	49	482	140	98	407	385	125	289	290	329	390	13
R6340R-50	7.75	1.94	18.82	5.50	3.85	15.89	15.17	4.92	11.38	11.42	12.96	15.34	.52
	197	49	478	140	98	404	385	125	298	290	329	390	13
R6P155Q-50	9.77	3.15	22.81	5.12	5.51	16.85	16.75	5.00	-	11.42	12.80	18.14	.50
	248	80	579	130	140	428	425	127	-	290	325	461	13
R6P355R-50	9.77	3.15	19.92	5.12	5.51	16.85	16.75	5.00	-	11.42	12.80	18.14	.50
	248	80	506	130	140	428	425	127	-	290	325	461	13
R7100R-50	10.79	3.64	22.77	8.36	8.50	21.50	18.00	7.90	-	14.76	16.14	20.03	.56
	274	92	578	212	216	546	457	201	-	375	410	509	14

Notice: Specifications subject to change without notice.

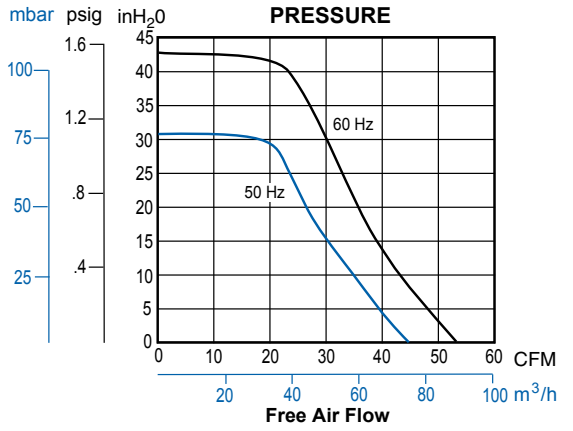
Product Specifications

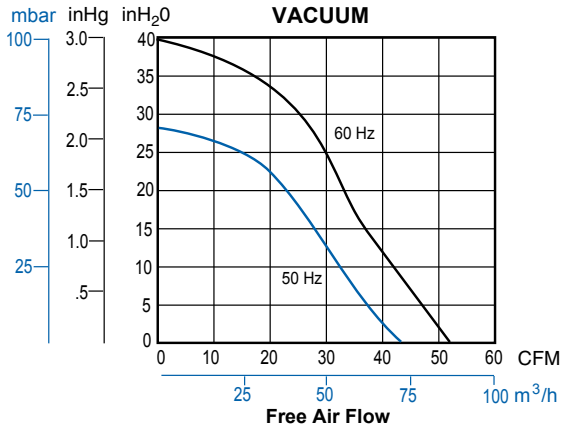
MODEL NUMBER		R3105N-50	R4110N-50	R4310P-50	R4P115N-50
Motor Enclosure		XPFC	XPFC	XPFC	XPFC
HP/kW	60 Hz	.50/0,37	1.0/0,75	1.0/0,75	1.5/1,1
	50 Hz	.33/0,25	.60/0,45	.60/0,45	1.0/0,75
Voltage	60 Hz	115/208-230-1	115/208-230-1	208-230/460-3	115/208-230-1
	50 Hz	110/220-240-1	110/220-240-1	220/380-3	110/220-240-1
Amps	60 Hz	5.2/2.9-2.6	11.4/6.2-5.6	3.4-3.3/1.6	20.3/11.2-10.6
	50 Hz	4.8/2.4-2.2	9.2/5.2-4.6	3.2/1.6	15.2/7.6-8
Starting Amps	60 Hz	12.5 @ 230V	36.5 @ 230V	19.7 @ 230V	60.6 @ 230V
	50 Hz	13 @ 220V	40.6 @ 240V	23.3 @ 220V	Consult Factory
Insulation Class		B	B	B	F
Recommended NEMA Starter Size		00/00	0/00	0/0	1/0
Net Weight (lbs/kg)		52/24	60/28	58/27	79/36

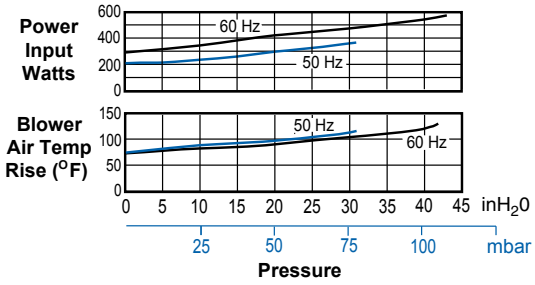
MODEL NUMBER		R5125Q-50	R5325R-50	R6130Q-50	R6340R-50
Motor Enclosure		XPFC	XPFC	XPFC	XPFC
HP/kW	60 Hz	2.0/1,5	2.0/1,5	3.0/2,2	4.0/3,0
	50 Hz	-	1.5/1,1	2.5/1,9	3.0/2,2
Voltage	60 Hz	115/230-1	208-230/460-3	230-1	208-230/460-3
	50 Hz	-	190-220/380-415-3	220-240-1	190-220/380-415-3
Amps	60 Hz	25/12.5	6.6-6.1/3.05	16.3	13-12/6
	50 Hz	-	5.0-4.4/2.5-2.6	14.7-13.5	14.4-13.4/7.2-6.8
Starting Amps	60 Hz	78 @ 230V	48 @ 230V	64 @ 230V	125 @ 230V
	50 Hz	-	Consult Factory	Consult Factory	Consult Factory
Insulation Class		F	F	F	F
Recommended NEMA Starter Size		1/0	0/0	1	1/0
Net Weight (lbs/kg)		77/35	75/34	129/59	112/51

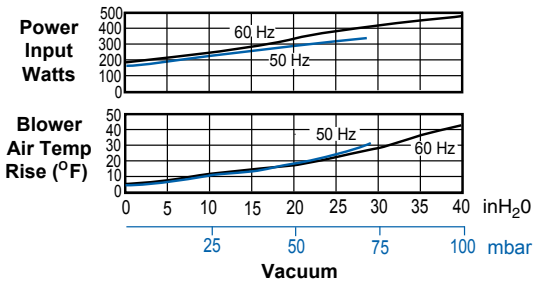
MODEL NUMBER		R6P155Q-50	R6P355R-50	R7100R-50
Motor Enclosure		XPFC	XPFC	XPFC
HP/kW	60 Hz	5.5/4,1	6.0/4,5	10/7,5
	50 Hz	4.0/3,0	4.5/3,4	8.0/6,0
Voltage	60 Hz	230-1	208-230/460-3	208-230/460-3
	50 Hz	220-240-1	190-220/380-415-3	190-220/380-415-3
Amps	60 Hz	29.9	20-18/9	26.5-24/12
	50 Hz	20.8-19.1	14.9-11/7.45-5.8	23.2-21.0/11.6-10.9
Starting Amps	60 Hz	198.4 @ 230V	59 @ 460V	105 @ 460V
	50 Hz	189 @ 240V	Consult Factory	Consult Factory
Insulation Class		F	F	F
Recommended NEMA Starter Size		0/2	1/0	2/1
Net Weight (lbs/kg)		243/110	233/105	297/134

R3105N-50

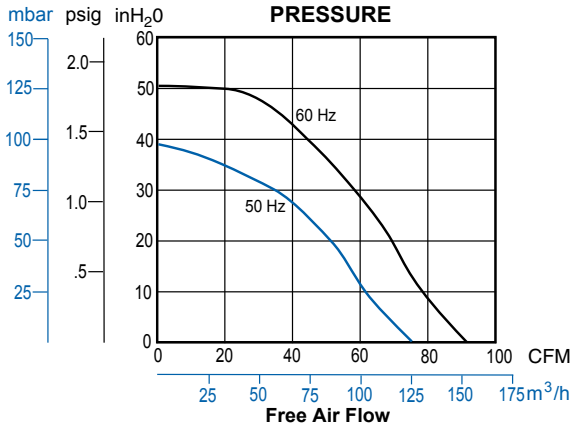


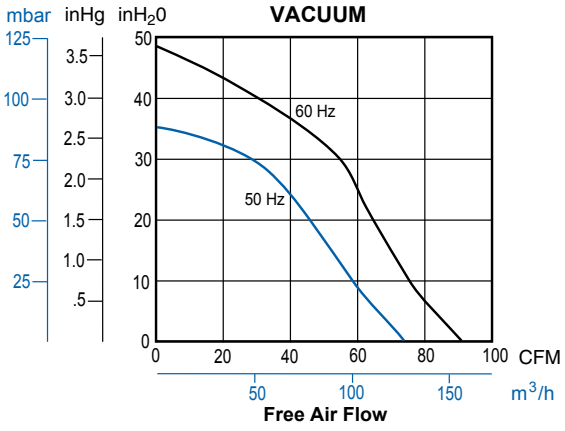


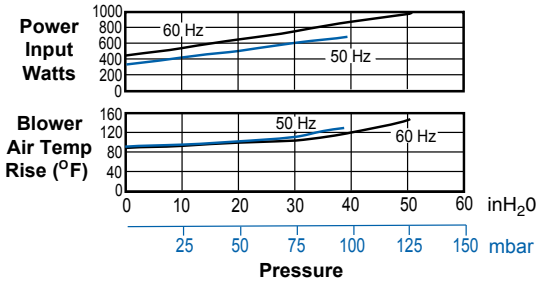


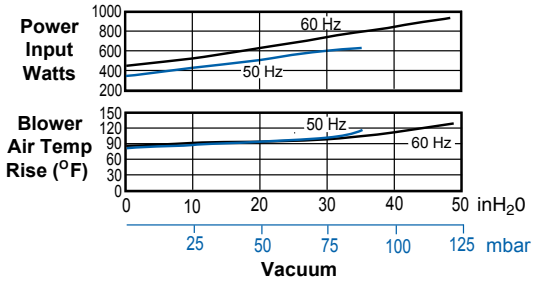


R4110N-50/R4310P-50









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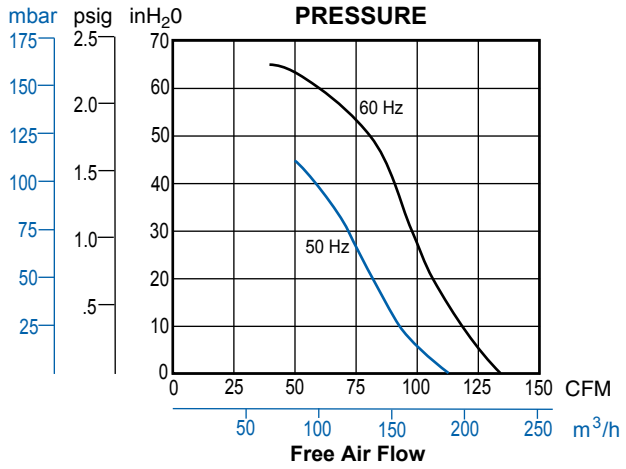

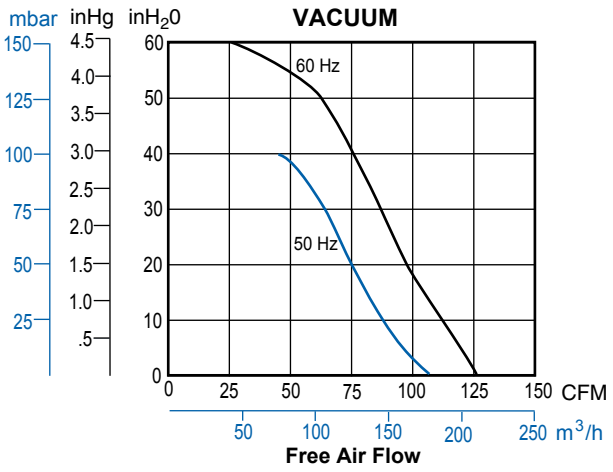

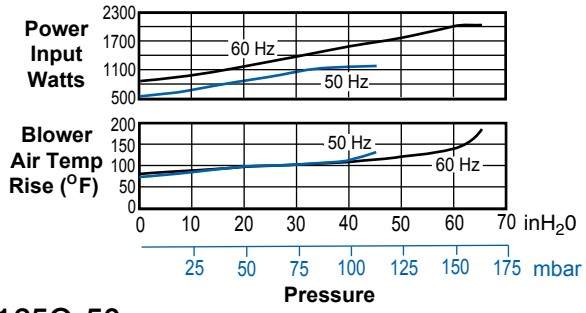

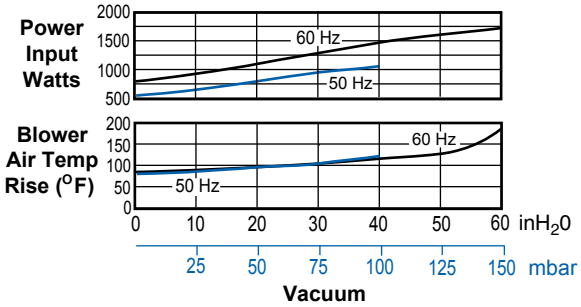

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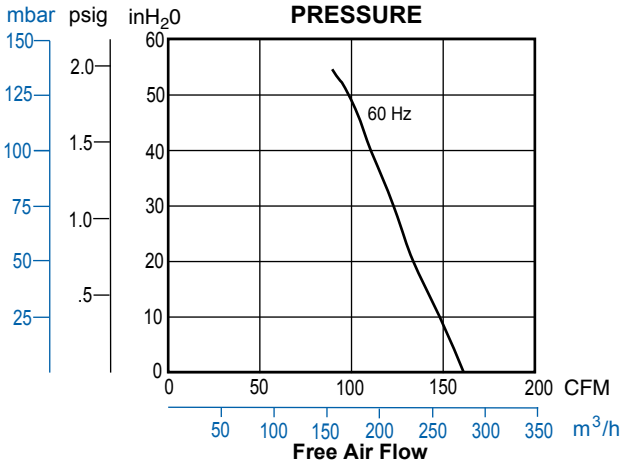

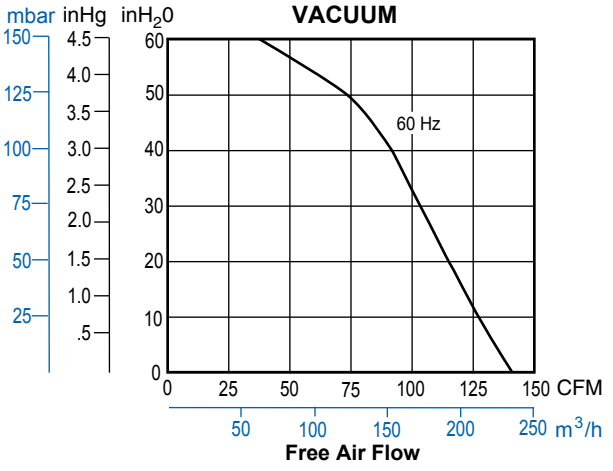

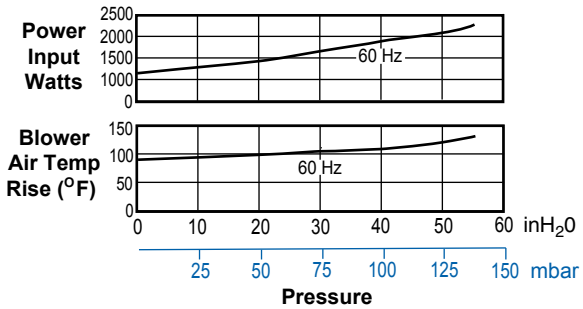

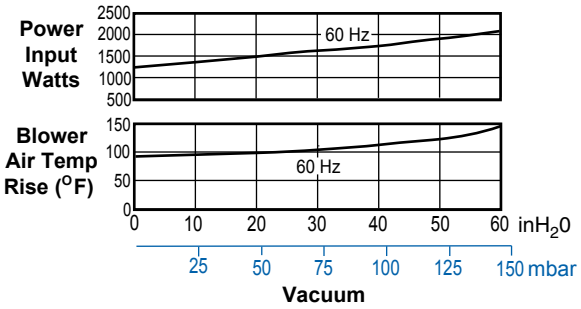

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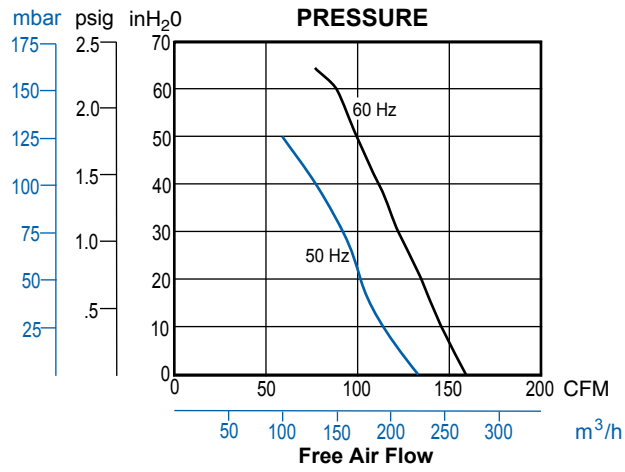
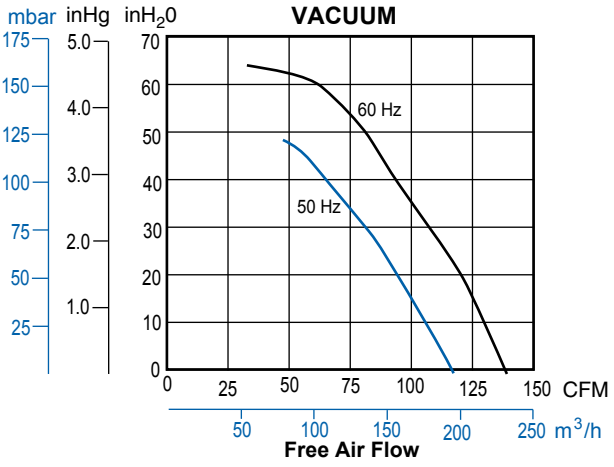
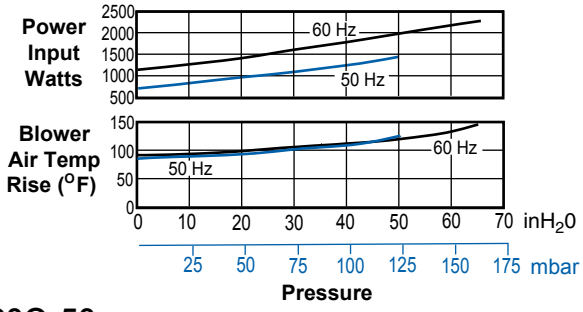
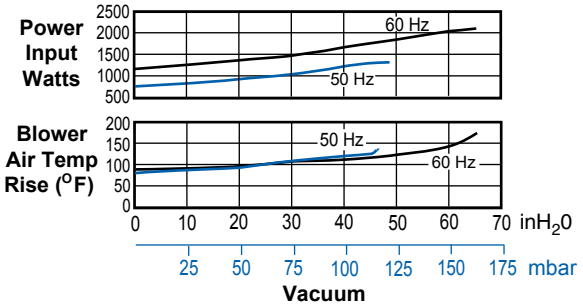
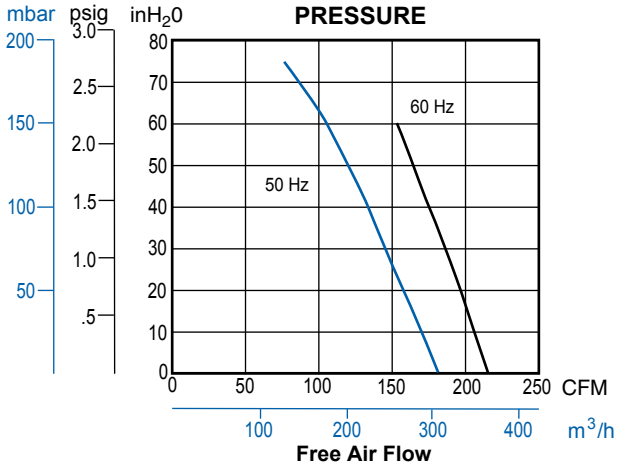


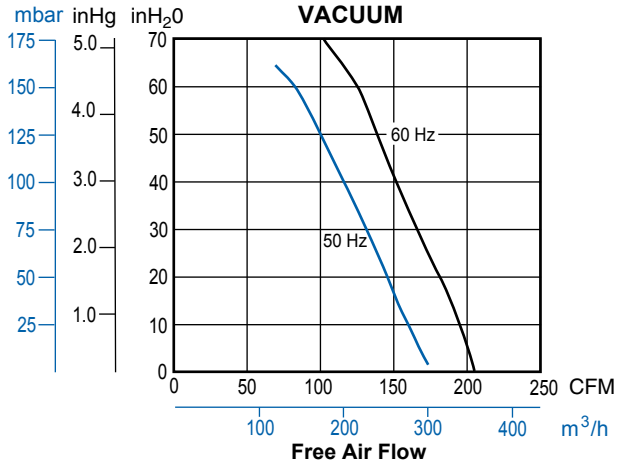


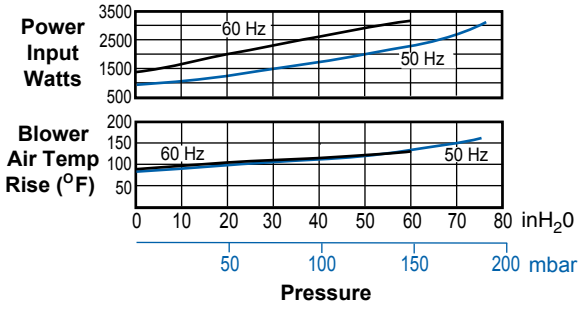


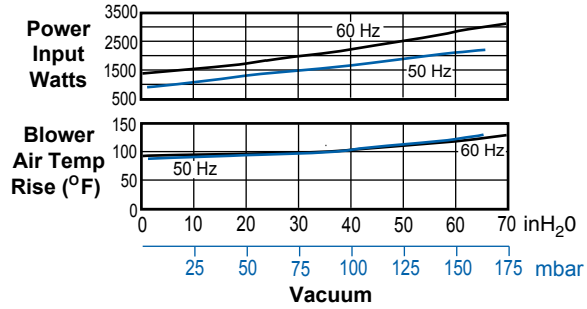


R6130Q-50









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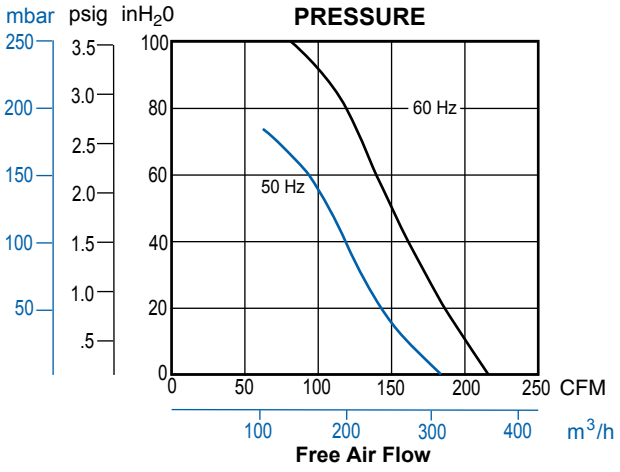

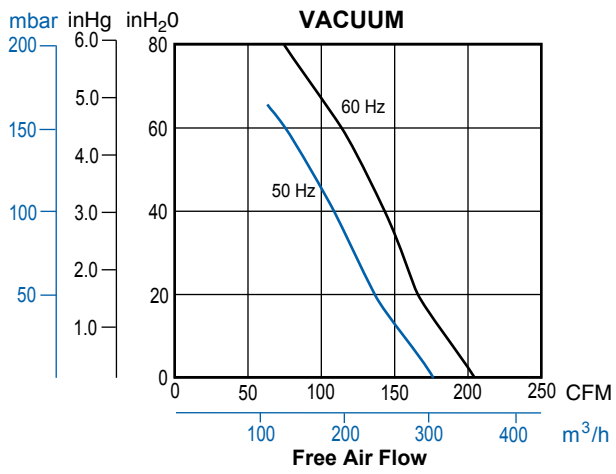

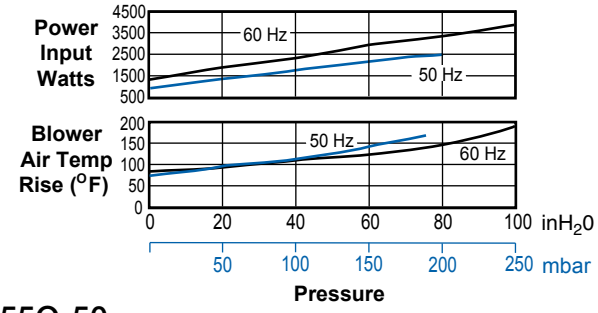

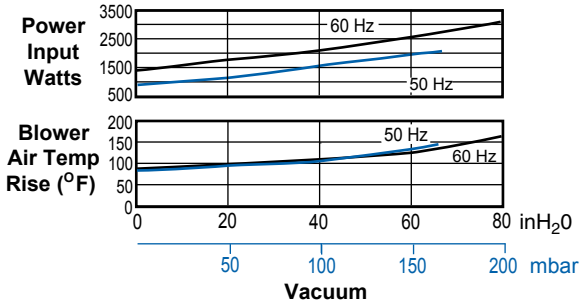

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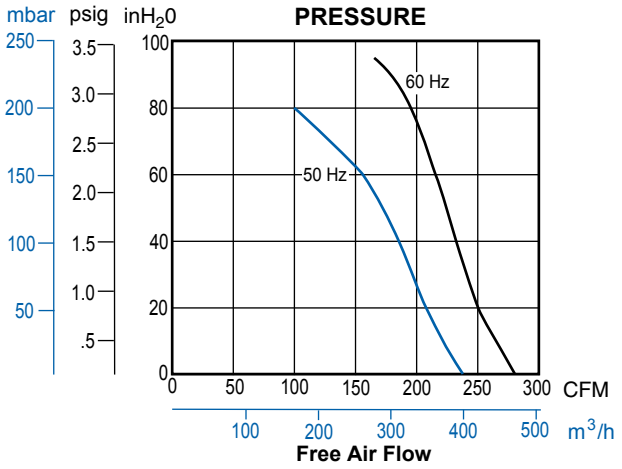

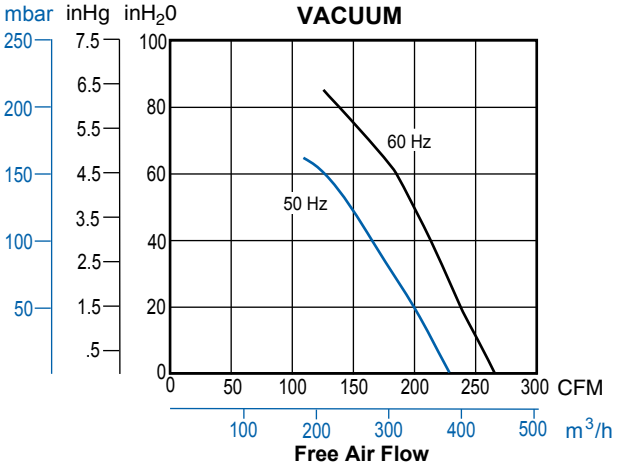

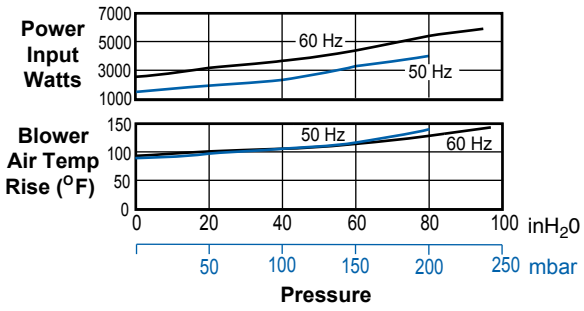

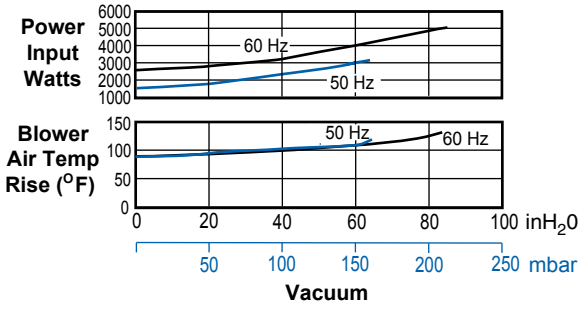

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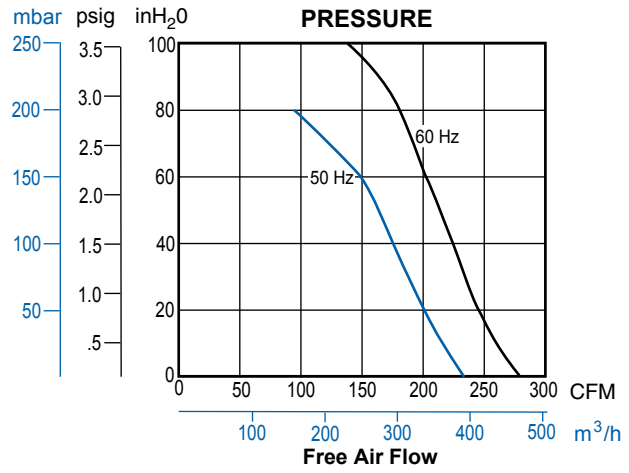

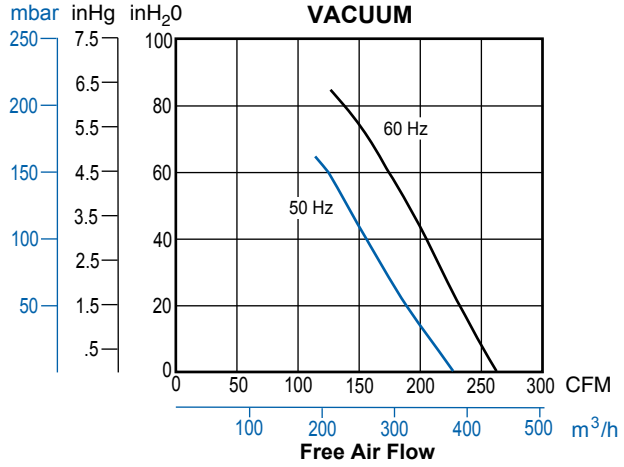

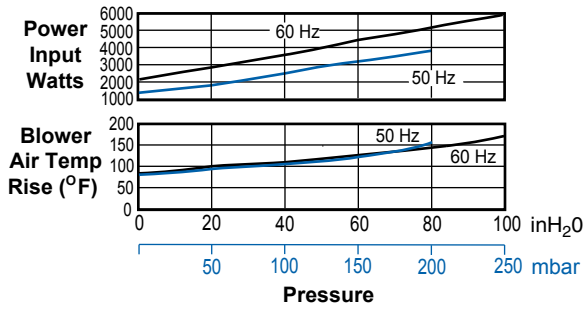

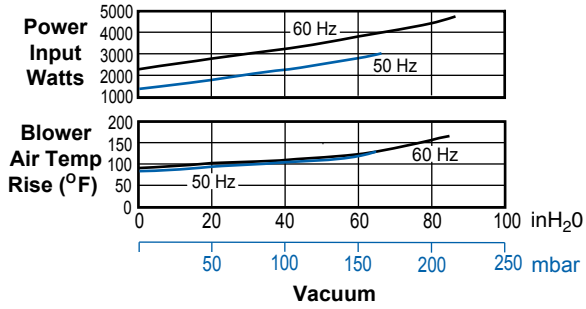

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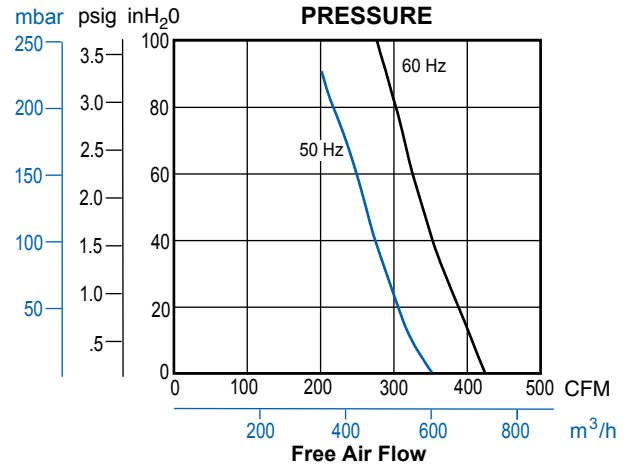
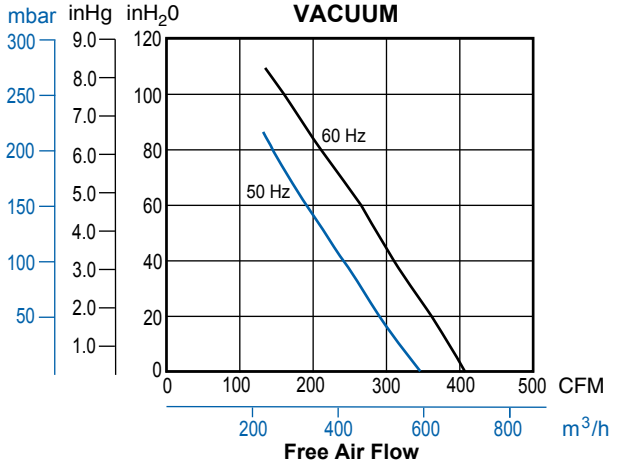
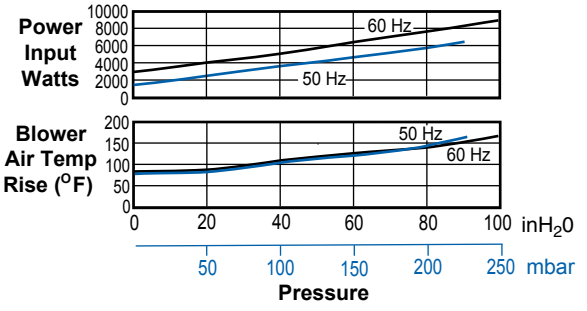
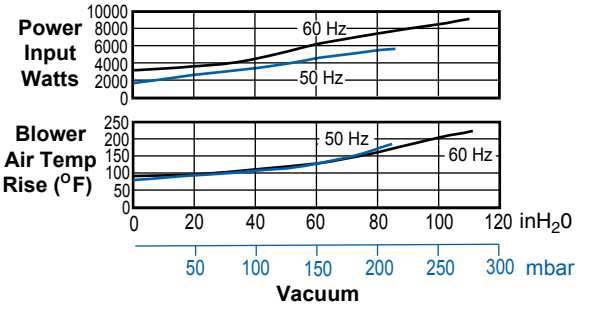
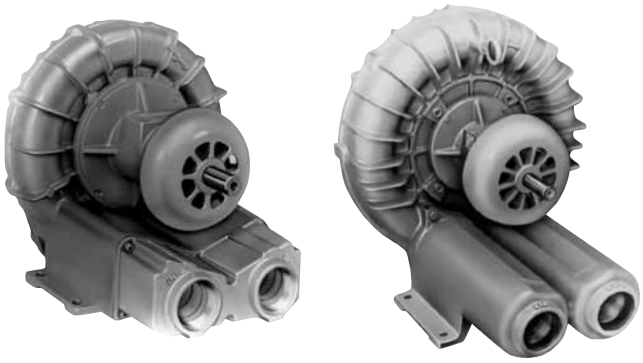










Separate Drive Models
Models SDR4, SDR5, SDR6, SDR6P

Pressure, vacuum, and air flow varies for these models, depending on the RPM. Reference the individual model's performance grids for specific data. The performance charts below reflect maximum duty for each model.

MODELS	Maximum Pressure (inH_2O)	Maximum Vacuum (inH_2O)	Maximum Air Flow (CFM)
SDR4	110	90	147
SDR5	152	120	240
SDR6	155	135	300
SDR6P	150	125	360

PRODUCT FEATURES

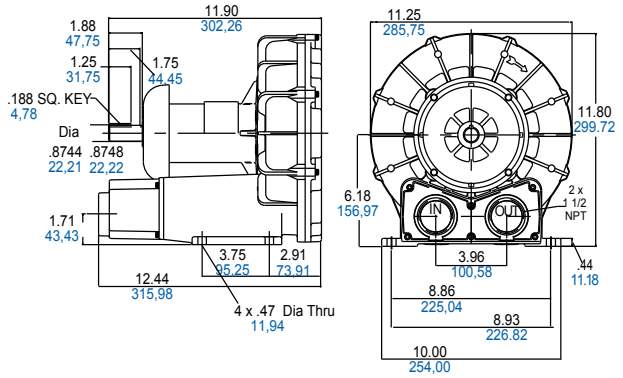
- Oilless operation
- Rugged construction, low maintenance
- Drive pulley size can be changed to lower the speed and change blower performance
- Aluminum cover, impeller, and housing on models SDR4, SDR5, SDR6
- Aluminum impeller, cast iron, and housing on model SDR6P

RECOMMENDED ACCESSORIES

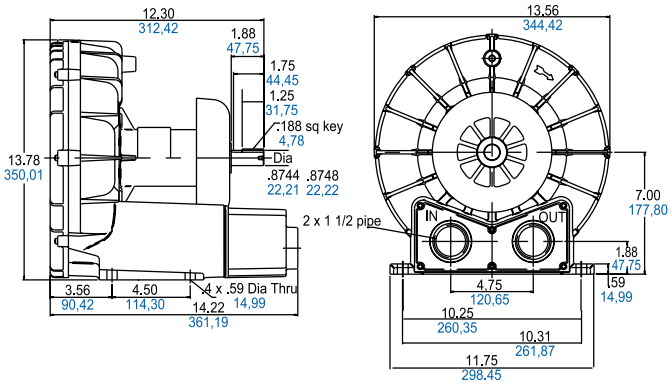
- Pressure gauge AE133
- Inlet filter AJ126D (SDR4)
  AJ126F (SDR5 - SDR6)
  AJ126G (SDR6P)
- Vacuum gauge AE134
- Vacum in-line filter AJ151E (SDR4)
  AJ151G (SDR5 - SDR6), AJ151H (SDR6P)
- Muffler AJ121D (SDR4, SDR5)
  AJ121F (SDR6, SDR6P)
- Relief valve AG258

Product Dimensions (inches, mm)

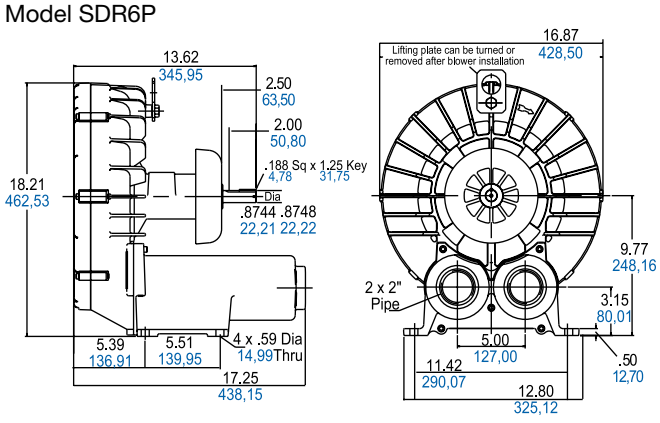
Model SDR4

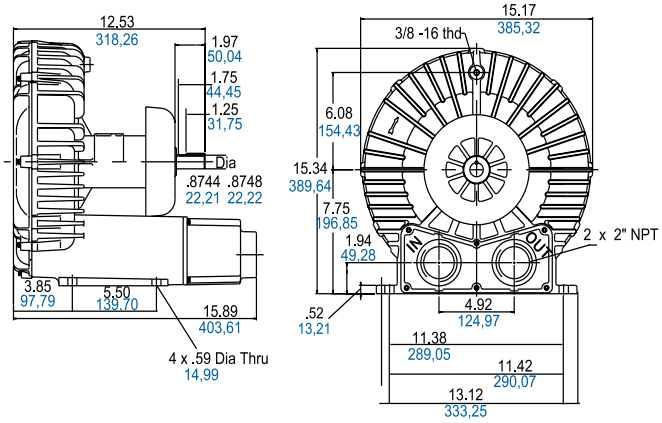


Model SDR5



Model SDR6P

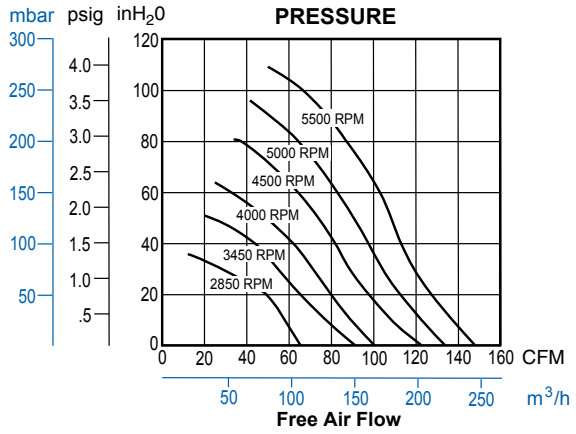


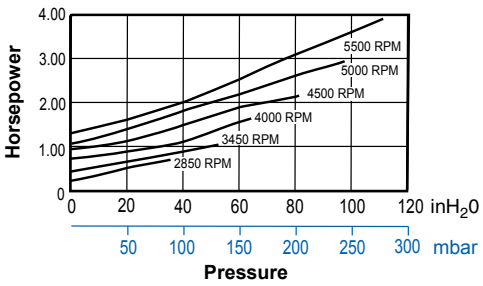


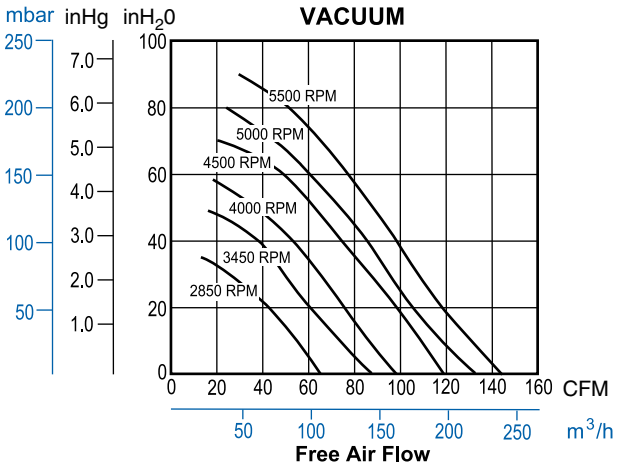
Product Specifications

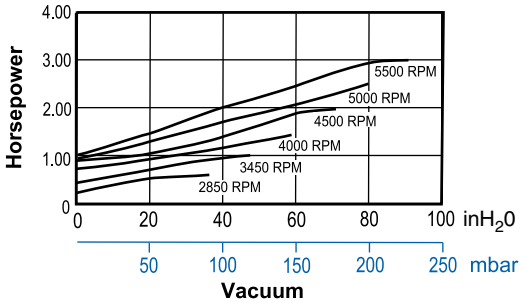
MODEL NUMBER	SDR4	SDR5	SDR6	SDR6P
Maximum RPM	5500	5500	5500	4500
HP/kW required at maximum RPM and Vacuum	3/2,2	8/6	11.5/8,6	10.6/7,9
HP/kW required at maximum RPM and Pressure	4/3	10/7,5	15/11,1	15/11,1
Net Weight (lbs/kg)	27/12	37/17	70/32	111/50

SDR4

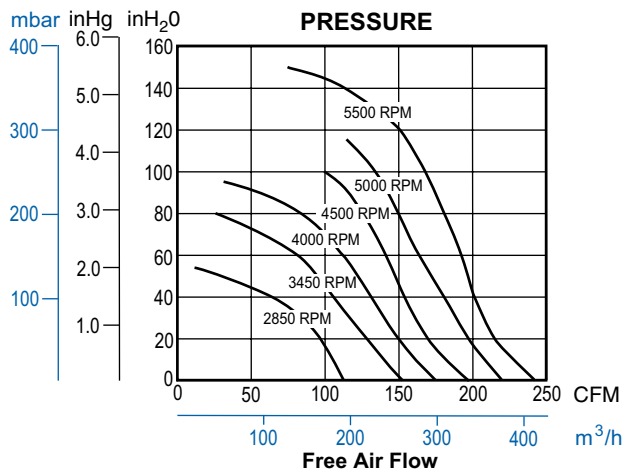


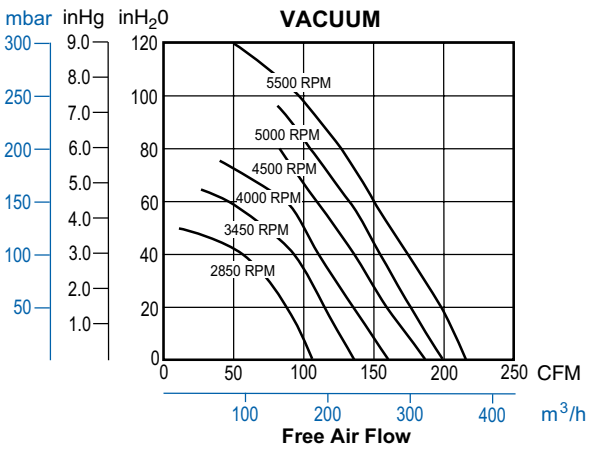


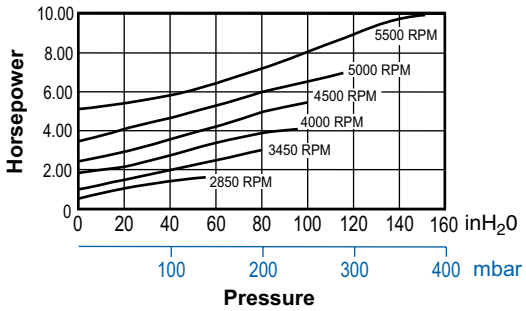


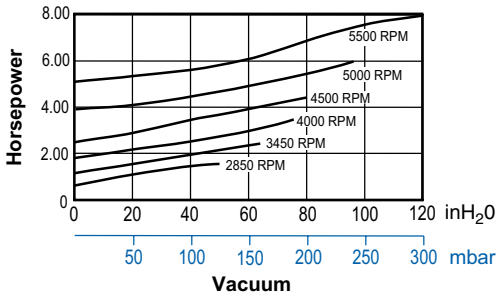


SDR5

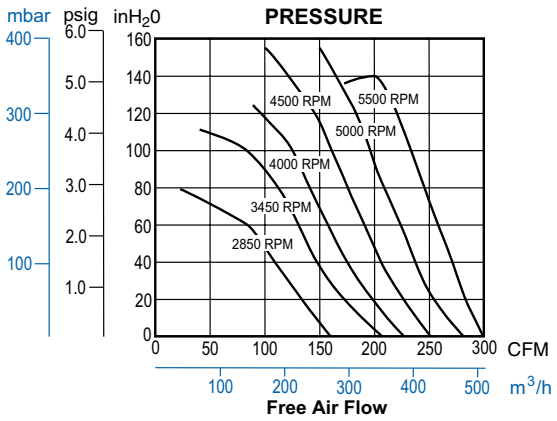

PRESSURE
mbar inHg inH20
5500 RPM
5000 RPM
4500 RPM
4000 RPM
3450 RPM
2850 RPM
CFM
m3/h
Free Air Flow

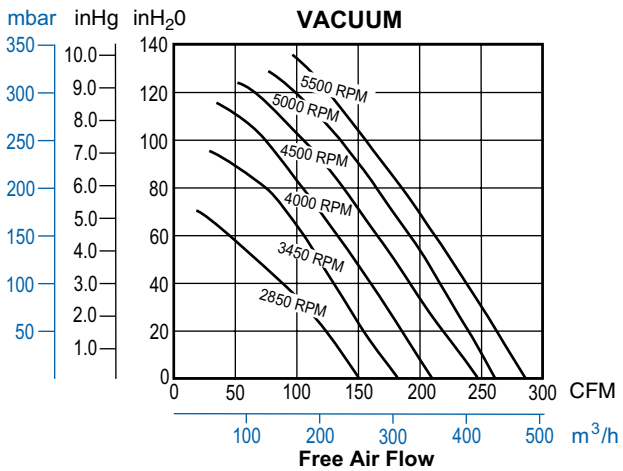

VACUUM
mbar inHg inH20
5500 RPM
5000 RPM
4500 RPM
4000 RPM
3450 RPM
2850 RPM
CFM
m3/h
Free Air Flow

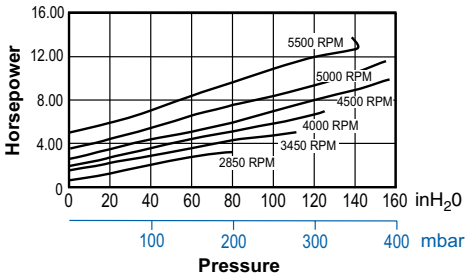

Horsepower
5500 RPM
5000 RPM
4500 RPM
4000 RPM
3450 RPM
2850 RPM
inH20
mbar
Pressure

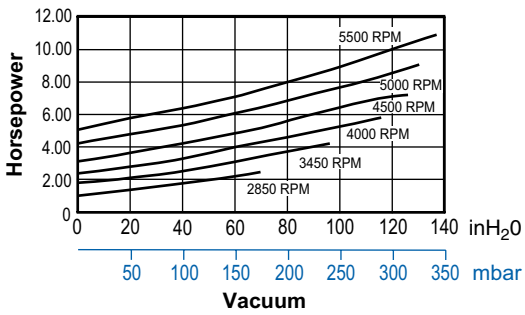

Horsepower
5500 RPM
5000 RPM
4500 RPM
4000 RPM
3450 RPM
2850 RPM
inH20
mbar
Vacuum

SDR6

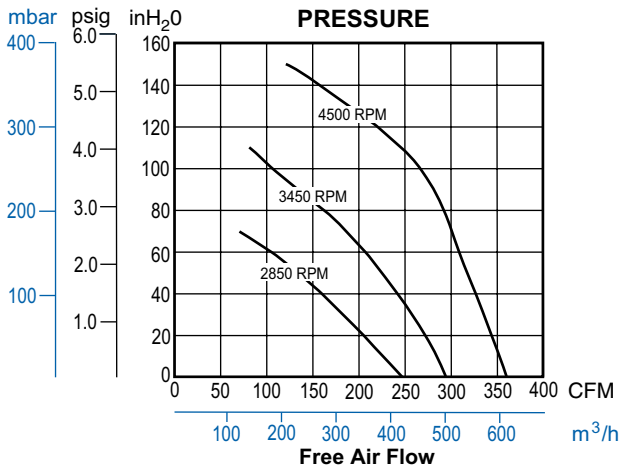

PRESSURE
mbar psig inH20
4500 RPM
5500 RPM
5000 RPM
4000 RPM
3450 RPM
2850 RPM
CFM
m3/h
Free Air Flow

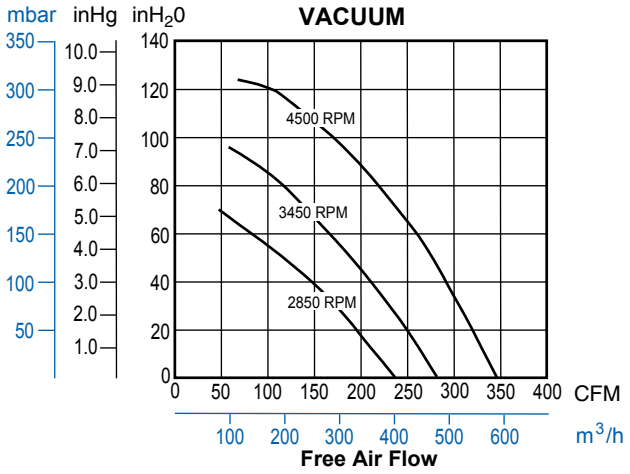

VACUUM
mbar inHg inH20
5500 RPM
5000 RPM
4500 RPM
4000 RPM
3450 RPM
2850 RPM
CFM
m3/h
Free Air Flow

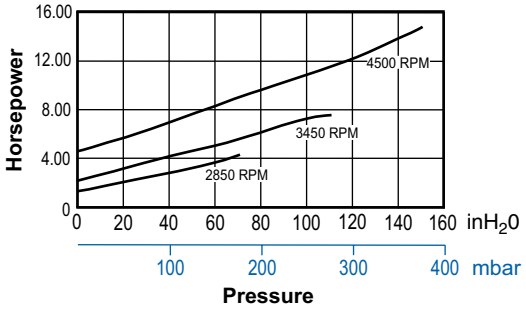

Horsepower
5500 RPM
5000 RPM
4500 RPM
4000 RPM
3450 RPM
2850 RPM
inH20
mbar
Pressure

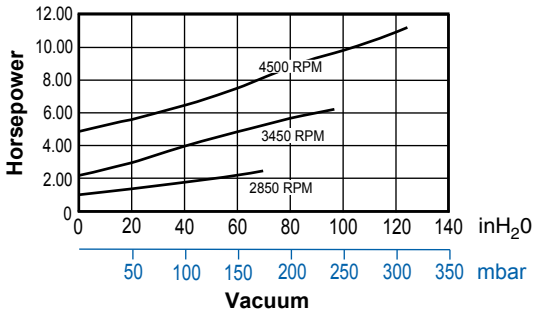

Horsepower
5500 RPM
5000 RPM
4500 RPM
4000 RPM
3450 RPM
2850 RPM
inH20
mbar
Vacuum

SDR6P


mbar
psig
inH20
PRESSURE
4500 RPM
3450 RPM
2850 RPM
CFM
m3/h
Free Air Flow


mbar
inHg
inH20
VACUUM
4500 RPM
3450 RPM
2850 RPM
CFM
m3/h
Free Air Flow

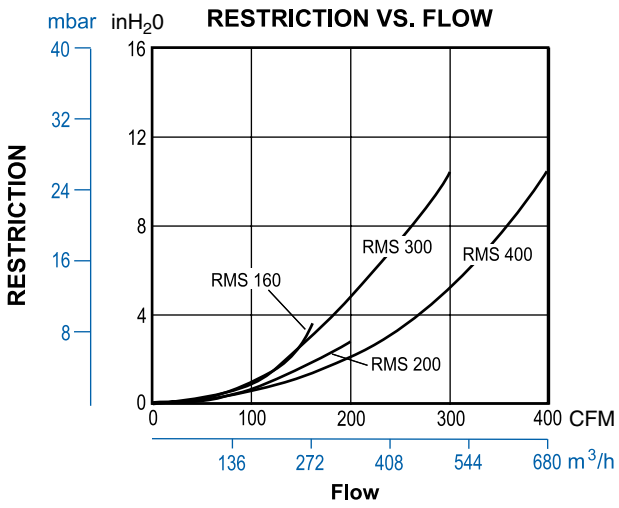

Horsepower
4500 RPM
3450 RPM
2850 RPM
inH20
mbar
Pressure


Horsepower
4500 RPM
3450 RPM
2850 RPM
inH20
mbar
Vacuum

Regenair® Liquid Separator

The separator removes liquids from the gas stream in a soil vapor extraction process, to help protect both blower and vapor treatment system from corrosion and mineral deposit buildup. The separator is located between the extraction wells and the blower. An inline filter is installed between separator and blower.

Cut away to show ball float. Above model shows optional explosion proof float switch AJ213

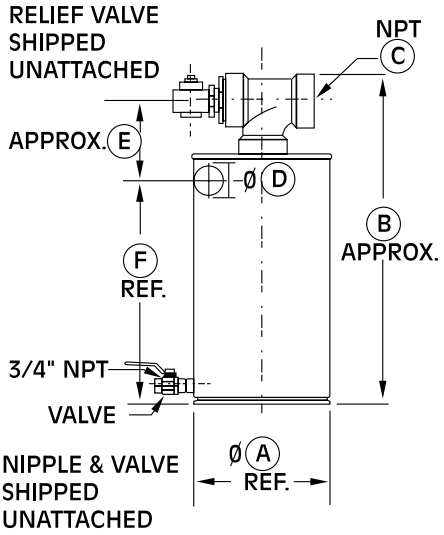


Specifications

Practical Design Engineered to remove and contain moisture ranging from a fine mist to slugs of water from blower inlet air streams, Gast separators incorporate a cyclonic action which results in a very high degree of efficiency. A floating ball valve which closes when the liquid level becomes too high prevents collected liquid from overflowing back into the air stream. When the float valve closes an integral vacuum relief valve opens, admitting air to cool the blower and prevent overheating.

Rugged Construction Gast separator drums are made from ribbed heavy gauge cold-rolled steel, with heavy steel inlet, drain and float switch ports welded to the drum wall. Drum interiors are epoxy coated to resist abrasion, corrosion and chemicals, while the drum exterior is coated with durable urethane. For ease of connection, the outlet port of female pipe threaded. The heavy-duty 304 stainless steel ball float resists chemicals. Maximum rated vacuum is 22 inHg (299 inH_2O).

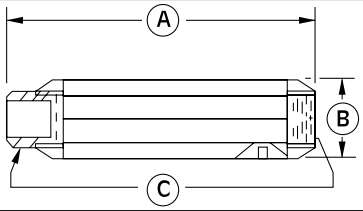
Included is a pilot operated precision relief valve capable of functioning over a wide duty range. This vacuum relief valve is designed and built to proven reliability and durability standards. Moving parts are nickelplated for corrosion resistance and smooth operation. Explosion proof AJ213 float switch is optional; single pole double throw, electrical rating 5 amp @ 125/250 VAC, 1" NPT mounting.



Part No.	Liq. Cap.(gal.)	A(dia.)	Dim. B	C(NPT)	D(dia.)	Dim. E	Dim. F	Used On
RMS160	10	14.8"	37.5"	2"	2"	7.5"	26.6"	R3, R4, R5
RMS200	19	19.7"	35"	2"	2"	7.5"	26.6"	R4, R4H, R4P, R5
RMS300	19	19.7"	35"	2.5"	2.5"	7.5"	26.6"	R4H, R4M, R5, R6, R6P, R6PS, R7H
RMS400	40	24"	44"	3"	3"	9.7"	29"	R6PP, R4M, R6, R6P, R7, R7S, R7P, R7H,R9, R9S

Mufflers

Designed to reduce noise by 5-8 dBa and remove high frequency sound associated with all blowers.



Part No.	Dim. A	Dim. B	Dim. C	Used On
AJ121B	7.46”	2.38”	1” NPT	R1, R2
AJ121C	7.94”	2.62”	1 1/4” NPT	R3
AJ121D	12.75”	3.25”	1 1/2” NPT	R4, R5, R4P, R4H, R7
AJ121F	17.05”	3.63”	2” NPT	R4H, R6, R6P, R6PP, R6PS
AJ121G	17.44”	4.25”	2 1/2” NPT	R7, R7P, R7S,
AJ121H	20.25”	4.75”	3” NPT	R6PP (Exhaust), R9, R9P, R9S
AJ121M	33.50”	6.00”	4” NPT	R7P (Exhaust)

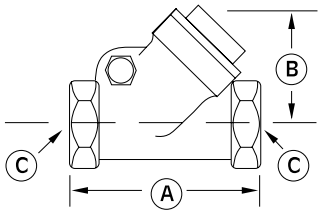
Pressure-Vacuum Gauge

To monitor the system performance so maximum duties are not exceeded. Using two gauges (one on each side of the filter) is a great way to know when the filter needs servicing.

Part No.			Used On
AJ497	Vacuum gauge	0-60 inH_2O, 1/4” NPT connection	R1, R2, R3, R4 R4H, R4P, R5, R7, R7P, R7S, R9, R9P, R9S
AE134	Vacuum gauge	0-160 inH_2O, 1/4” NPT connection	R4P, R6PP, R6PS, R6P, R4M, R6, R7, R7S, R7P, R9, R9P, R9S
AE134F	Vacuum gauge	0-15 inHg, 1/4” NPT connection	R4H,
AE133	Pressure gauge	0-160 inH_2O, 1/4” NPT connection	R6PP, R6P, R5, R4P, R6, R7P, R9, R9P
AE133A	Pressure gauge	0-200 inH_2O, 1/4” NPT connection	R6PS, R7, R7S
AE133F	Pressure gauge	0-15 psi, 1/4” NPT connection	R4H, R9S
AJ496	Pressure gauge	0-60 inH_2O, 1/4” NPT connection	R1, R2, R3, R4

Check Valve

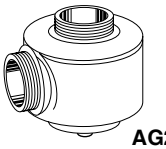
Designed to prevent back-wash of fluids that would enter the blower. Also prevents air back-streaming if needed. Can be mounted with discharge either vertical or horizontal. Valve will open with 3” of water pressure.



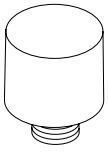
Part No.	Dim. A	Dim. B	Dia. C
AH326B	3.57”	2.32”	1” NPT
AH326C	4.19”	2.69”	1 1/4” NPT
AH326D	4.50”	2.94”	1 1/2” NPT
AH326F	5.25”	3.82”	2” NPT

Relief Valve

By setting a relief valve at a given pressure/vacuum you can ensure excessive duties will not harm the blower or products in your application.



AG258 Series



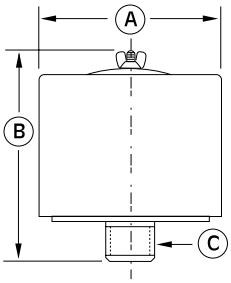
PV Series

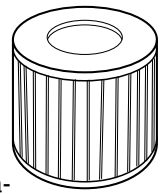
Part No.		Used On	
AG258	Relief valve	1-1/2” NPT adjustable 30-200 inH_2O, vac. or press., 200 CFM max.	R4, R4H, R4P, R5, R6, R6P, R6PS, R7
AG258F	Relief valve	2-1/2” NPT adjustable 25-200 inH_2Os, vacuum or pressure, 570 CFM	R6PP, R7P, R7S, R9, R9P, R9S
PV102	Relief valve	For pressure, pre-set for 10.2 psi, 1-1/4” NPT connection (60 Hz)	R4H

Filters

Inlet filters (for pressure)

Part No.	Dim. A	Dim. B	Dim. C	Filter Replacement	Used On
AJ126B	6.00”	4.62”	1” MPT	AJ134B (10 micron)	R1, R2
AJ126C	6.00”	7.12”	1 1/4” MPT	AJ134C (10 micron)	R3
AJ126D	7.70”	7.25”	1 1/2” MPT	AJ134E (10 micron)	R4, R4H, R4P, R5
AJ126F	10.63”	4.81”	2” MPT	AG340 (10 micron)	R6, R6P, R6PS, R6PP, R9
AJ126G	10.00”	13.12”	2 1/2” MPT	AJ135A (10 micron)	R7, R7P,
AJ126L	10.00”	14.62”	4” MPT	AJ135C (10 micron)	Consult factory
AJ126M	16.00”	14.62”	5” MPT	AJ135H (10 micron)	Consult factory





MPT = Male Pipe Thread. FPT = Female Pipe Thread. All are heavy-duty for high amounts of particulates.
Inlet filters for REGENAIR® blowers are drip-proof when mounted as shown.

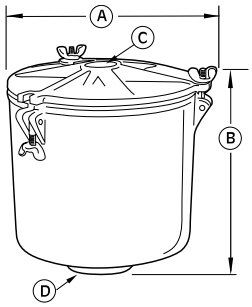
Filters

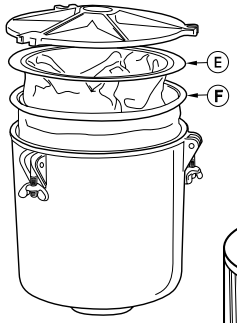
In locations where there are high amounts of dust, powder, or dirt suspended in the air, inline filters (for vacuum applications) and inlet filters (pressure applications), should be used. Keeping particulates from entering the blower will ensure smooth operation and trouble free service life.

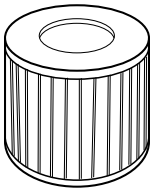
Inline filters (for vacuum)

AV series

Part No.	Dim. A	Dim. B	Dim. C	Dim. D	Used On
AV460	8 1/4”	8 7/8”	1” FPT	1” FPT	R1, R2
AV460C	8 1/4”	8 7/8”	1 1/4” FPT	1 1/4” FPT	R3



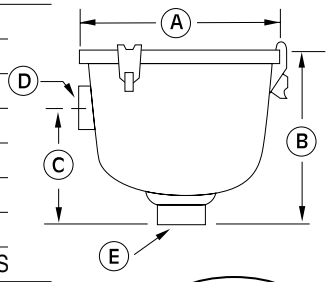


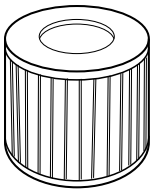


Replacement elements for AV460 and AV460C:
AV463A - Cloth bag, 50 micron, sold in 3 pack (letter F on diagram).
AV469A - Paper filter, 5-10 micron, sold in 12 pack (letter E on diagram).

AJ series

Part No.	Dim. A	Dim. B	Dim. C	Dim. D	Dim.E	Filter Replacement	Used On
AJ151A	5.88”	4.50”	2.75”	1” FPT	1” FPT	AJ135D (10 micron)	R1
AJ151B	7.38”	6.81”	4.62”	1” FPT	1” FPT	AJ135E (10 micron)	R2
AJ151C	7.38”	6.81”	4.62”	1 1/4” FPT	1 1/4” FPT	AJ135E (10 micron)	R3
AJ151D	7.38”	6.81”	4.62”	1 1/2” FPT	1 1/2” FPT	AJ135E (10 micron)	R4, R4P
AJ151E	8.75”	10.25”	5.00”	2” FPT	2” FPT	AJ135F (10 micron)	R4H, R4P, R5
AJ151G	8.75”	10.50”	5.50”	2 1/2” FPT	2 1/2” FPT	AJ135G (10 micron)	R6, R6P,
AJ151H	14.00”	27.13”	18.50”	3” MPT	3” MPT	AJ135C (10 micron)	R6PP, R6PS, R7
AJ151M	18.50”	28.13”	19.50”	5” MPT	5” MPT	AJ135H (10 micron)	R7P, R7S, R9, R9P, R9S





MPT = Male Pipe Thread. FPT = Female Pipe Thread. All are heavy-duty for high amounts of particulates.
Inline filters for REGENAIR® blowers are drip-proof when mounted as shown.

Regenair® Filter Restrictions with Clean Element

Inlet Filters

Blower	Filter	Restriction in inH_2O at CFM Flow Indicated
R1	AJ126B	2.2” @ 27 CFM
R2	AJ126B	4.5” @ 40 CFM
R3	AJ126C	2.5” @ 50 CFM
R4H	AJ126D	8” @ 120 CFM
R4	AJ126D	4” @ 85 CFM
R4P	AJ126D	8” @ 120 CFM
R5	AJ126D	11” @ 146 CFM
R6	AJ126F	7” @ 200 CFM
R6P/R6PS	AJ126F	11” @ 265 CFM
R6PP	(2) AJ126F	10” @ 240 CFM
R7/R7S	AJ126G	12” @ 400 CFM
R7P	(2) AJ126G	12”@ 400 CFM
R9S	AJ126M	Consult factory
R9P	AJ126M	Consult factory

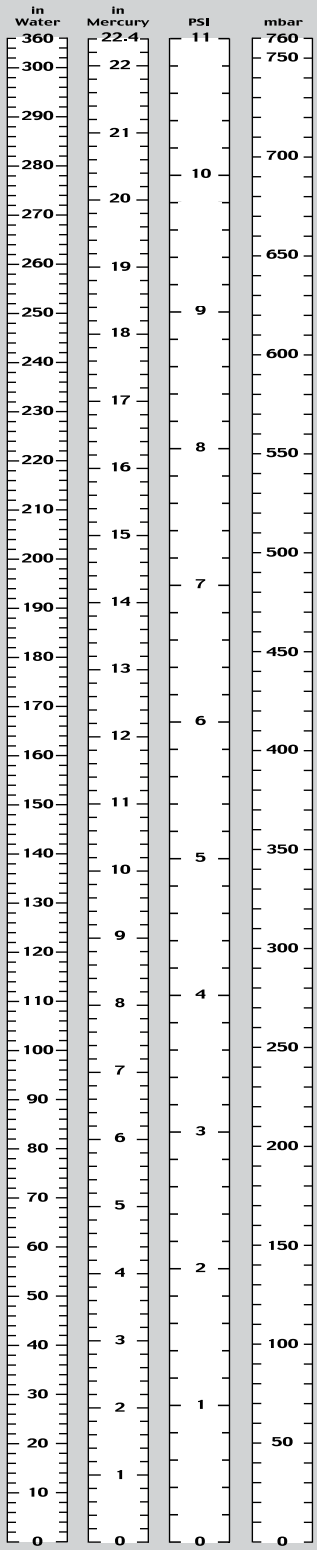
Inline Filters

Blower Size	Filter Number	Restriction in inH_2O at CFM Flow Indicated
R1	AJ151A	1” @ 25 CFM
	AV460	2” @ 25 CFM
R2	AJ151B	2” @ 40 CFM
	AV460	5” @ 40 CFM
R3	AJ151C	2” @ 50 CFM
	AV460C	3” @ 50 CFM
R4	AJ151D	3” @ 100 CFM
R4P	AJ151E	3” @ 100 CFM
R4H	AJ151E	3” @ 120 CFM
R5	AJ151E	4” @ 160 CFM
R6	AJ151G	2” @ 200 CFM
R6P/R6PS	AJ151G	3” @ 300 CFM
6PP	AJ151H	8”@ 400 CFM
R9S	AJ151 M	Consult factory
R9P	AJ151 M	Consult factory

Standard Conversions

Multiply	By	To Get
Atmospheres	29.92	Inches of Mercury
Atmospheres	14.70	Psi
Atomspheres	76.0	Cms of Mercury
Bars	0.9869	Atmospheres
Bars	14.50	Psi
British Thermal Units	3.927×10^{-4}	Horsepower-Hours
British Thermal Units	2.928×10^{-4}	Kilowatt-Hours
Centimeters of Mercury	0.1934	Psi
Cubic Feet	7.481	Gallons
Cubic Feet	28.32	Liters
Cubic Feet/Minute	1.6992	Cubic Meters/Hour
Cubic Meters/Hour	.5886	Cubic Feet/Minute
Cubic Meters	35.31	Cubic Feet
Cubic Meters	61,023	Cubic Inches
Cubic Meters	1.308	Cubic Yards
Horsepower	42.44	British Thermal Units/Min.
Horsepower	745.7	Watts
Horsepower	.746	Kilowatts
Horsepower-Hours	2547	British Thermal Units
Inches	2.540	Centimeters
Inches	25.40	Millimeters
Inches of Mercury	0.03342	Atomspheres
Inches of Mercury	13.60	Inches of Water
Inches of Mercury	0.4912	Psi
Inches of Water	0.07355	Inches of Mercury
Inches of Water	25.40	Kgs/Sq. Meter
Inches of Water	0.03613	Psi
Inches of Water	1.868	Mm of Mercury
Inches of Water	2.491	mbar
Kilograms/Sq. cm	14.22	Psi
Kilopascals (kpa)	0.145	Psi
Kilowatts	1.341	Horsepower
Kilowatts	56.92	British Thermal Units/Min.
Kilowatt-Hours	3415	British Thermal Units
Liters	61.02	Cubic Inches
Liters	0.03531	Cubic Feet
Millibar	.0145	Psi
Millibar	.402	Inches of Water
Mms. of Mercury	0.0394	Inches of Mercury
Mms. of Mercury	0.01934	Psi
Psi	0.06804	Atmospheres
Psi	27.7	Inches of Water
Psi	2.036	Inches of Mercury
Psi	.07031	Kgs/Sq. Centimeter
Psi	6.895	Kilopascals (kpa)
Psi	68.95	mbar
Psi	.069	bar
Pounds of Water	27.68	Cubic Inches
Pounds of Water Evaporated at 212° F	970.3	British Thermal Units
Temp. (Degs.C.) + 273	1	Abs. Temp. (Degs.C.)
Temp. (Degs.C.) + 17.8	1.8	Temp. (Degs. Fahr.)
Temp. (Degs. F.) + 460	1	Abs. Temp. (Degs F.)
Temp. (Degs. F.) - 32	5/9	Temp. (Degs. Cent.)
Watts	0.05692	British Thermal Units/Min.
Watts	1.341×10^{-3}	Horsepower
Watts	10^{-3}	Kilowatts
Watts-Hour	3.415	British Thermal Units
Watts-Hour	1.341 x 10-	Horsepower/Hours
Watts-Hour	10^{-3}	Kilowatt-Hours

VACUUM–PRESSURE EQUIVALENCE TABLE



IP Codes (Ingress Protection)

IEC 60529 outlines an international classification system for the sealing effectiveness of enclosures of electrical equipment against the intrusion into the equipment of foreign bodies (i.e., tools, dust, fingers) and moisture. This classification system utilizes the letters “IP” (“Ingress Protection”) followed by two digits. (An “X” is used for one of the digits if there is only one class of protection; i.e., IP X 4 which addresses moisture resistance only.)

Degrees of Protection - First Digit

The first digit of the IP code indicates the degree that persons are protected against contact with moving parts (other than smooth rotating shafts, etc.) and the degree that equipment is protected against solid foreign bodies intruding into an enclosure.

0 No special protection
1 Protection from a large part of the body such as a hand (but no protection from deliberate access); from solid objects greater than 50 mm in diameter
2 Protection against fingers or other objects not greater than 80mm in length and 12 mm in diameter
3 Protection from entry by tools, wires, etc., with a diameter or thickness greater than 2.5 mm
4 Protection from entry by solid objects with a diameter or thickness greater than 1.0 mm
5 Protection from the amount of dust that would interfere with the operation of the equipment
6 Dust-tight

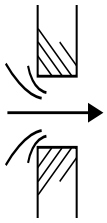
Degrees of Protection - Second Digit

The second digit indicates the degree of protection of the equipment inside the enclosure against the harmful entry of various forms of moisture (e.g. dripping, spraying, submersion, etc.).

0 No special protection
1 Protection from dripping water
2 Protection from vertically dripping water
3 Protection from sprayed water
4 Protection from splashed water
5 Protection from water projected from a nozzle
6 Protection against heavy seas, or powerful jets of water
7 Protection against immersion
8 Protection against complete, continuous submersion in water

Air Flow Through An Orifice (in CFM)

- Downstream pressure = 14.7 psia (standard atmospheric pressure)
- Air Temperature = 70 °F (21 °C)
- Cd (discharge coefficient) = 0.65 (for sharp edge orifice — See drawing)



Up Stream Pressure	Orifice Diameters (in Inches)																			
in. H_2O	1/32	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
1.00	0.014	0.054	0.217	0.489	0.869	1.36	1.96	2.66	3.48	7.82	13.9	21.7	31.3	42.6	55.6	70.4	86.9	105	125
2.00	0.019	0.077	0.307	0.691	1.23	1.92	2.76	3.76	4.92	11.1	19.7	30.7	44.2	60.2	78.6	99.5	123	149	177
3.00	0.024	0.094	0.376	0.846	1.50	2.35	3.39	4.61	6.02	13.5	24.1	37.6	54.2	73.7	96.3	122	150	182	217
4.00	0.027	0.109	0.434	0.977	1.74	2.71	3.91	5.32	6.95	15.6	27.8	43.4	62.6	85.1	111	141	174	210	250
5.00	0.030	0.121	0.486	1.09	1.94	3.04	4.37	5.95	7.77	17.5	31.1	48.6	69.9	95.2	124	157	194	235	280
10.00	0.043	0.172	0.686	1.54	2.75	4.29	6.18	8.41	11.0	24.7	43.9	68.6	98.9	135	176	222	275	332	395
15.00	0.053	0.210	0.840	1.89	3.36	5.25	7.56	10.3	13.4	30.3	53.8	84.0	121	165	215	272	336	407	484
20.00	0.061	0.242	0.970	2.18	3.88	6.06	8.73	11.9	15.5	34.9	62.1	97.0	140	190	248	314	388	469	559
25.00	0.068	0.271	1.08	2.44	4.34	6.77	9.76	13.3	17.3	39.0	69.4	108	156	212	277	351	434	525	624
30.00	0.074	0.297	1.19	2.67	4.75	7.42	10.7	14.5	19.0	42.7	76.0	119	171	233	304	385	475	574	684
35.00	0.080	0.320	1.28	2.88	5.13	8.01	11.5	15.7	20.5	46.1	82.0	128	185	251	328	415	513	620	738
40.00	0.086	0.342	1.37	3.08	5.48	8.56	12.3	16.8	21.9	49.3	87.6	137	197	268	351	444	548	663	789
45.00	0.091	0.363	1.45	3.27	5.81	9.07	13.1	17.8	23.2	52.3	92.9	145	209	285	372	470	581	703	836
50.00	0.096	0.382	1.53	3.44	6.12	9.56	13.8	18.7	24.5	55.1	97.9	153	220	300	392	496	612	740	881
55.00	0.100	0.401	1.60	3.61	6.41	10.0	14.4	19.6	25.7	57.7	10.3	160	231	314	411	520	641	776	924
60.00	0.105	0.419	1.67	3.77	6.70	10.5	15.1	20.5	26.8	60.3	107	167	241	328	429	542	670	810	964
65.00	0.109	0.435	1.74	3.92	6.97	10.9	15.7	21.3	27.9	62.7	111	174	251	341	446	564	697	843	1003
70.00	0.113	0.452	1.81	4.06	7.23	11.3	16.3	22.1	28.9	65.0	116	181	260	354	463	585	723	874	1041
75.00	0.117	0.467	1.87	4.21	7.48	11.7	16.8	22.9	29.9	67.3	120	187	269	366	479	606	748	905	1077
80.00	0.121	0.482	1.93	4.34	7.72	12.1	17.4	23.6	30.9	69.5	124	193	278	378	494	625	772	934	1112
85.00	0.124	0.497	1.99	4.47	7.95	12.4	17.9	24.4	31.8	71.6	127	199	286	390	509	644	795	962	1145
90.00	0.128	0.511	2.04	4.60	8.18	12.8	18.4	25.1	32.7	73.6	131	204	294	401	524	663	818	990	1178
95.00	0.131	0.525	2.10	4.73	8.40	13.1	18.9	25.7	33.6	75.6	134	210	302	412	538	680	840	1016	1210
100.00	0.135	0.538	2.15	4.85	8.61	13.5	19.4	26.4	34.5	77.5	138	215	310	422	551	698	861	1042	1241
105.00	0.138	0.551	2.21	4.96	8.82	13.8	19.9	27.0	35.3	79.4	141	221	318	432	565	7151	882	1068	1271
110.00	0.141	0.564	2.26	5.08	9.03	14.1	20.3	27.6	36.1	81.2	144	226	325	442	578	731	903	1092	1300

Technical Information and Definitions

Definitions:

CFM – cubic feet of air per minute
SP – static pressure inches of water
HP – horsepower
RPM – speed in revolutions per minute
d – density in pounds per cubic foot
1 – known conditions
2 – desired conditions

Standard Air-air at 68 °F (absolute temperature 528°) and 29.92 inHg. (barometric pressure at sea level). The density of such air is 0.075 lbs/cu ft. and the specific volume is 13.29 cu ft./lb The specific gravity is 1.0.

H_2O CFM vs SCFM
The difference between “Cubic Feet Per Minute” and “Standard Cubic Feet Per Minute” is simply one of air density. The word “Standard”, in this unit of measure, refers to the air being at standard temperature and pressure. In this case it will have standard air density. Regenair blowers performance is stated in terms of CFM, the volume of air they move.

Fan Laws

The following fan laws apply for the range of air performance where induction motor-driven blowers operate, that is, under 100 inches of water static pressure or vacuum (where it may be assumed that air is incompressible). The fan laws may also be used if the pressure of both fan conditions is over 100 inches of water but the pressure change is less than 30%.

1. Effect Of A Speed Change

CFM is proportional to Speed	$CFM_2 = CFM_1 \times (RPM_2/RPM_1)$
(The volume changes in direct ratio to the speed)	
SP is proporational to Speed^2	$SP_2 = SP_1 \times (RPM_2/RPM_1)^2$
(The pressure changes as the square of the speed ratio)	
HP is proportional to Speed^3	$HP_2 = HP_1 \times (RPM_2/RPM_1)^3$
(The horsepower changes as the cube of the speed ratio)	(Also known as the 1-2-3 rule of blowers)

2. Altitude And Temperature Change The Density Of Air

CFM is constant	$CFM_2 = CFM_1$
SP is proportional to density	$SP_2 = SP_1 (d_2/d_1)$
HP is proportional to density	$HP_2 = HP_1 (d_2/d_1)$

Volume Changes In Direct Ratio To Speed

For example, a blower is operating at 3500 RPM and delivering 800 cfm. If the speed is reduced to 3000 RPM, what is the new volume?

Let:

V_1 – original volume
V_2 – new volume
RPM_1 – orginal speed
RPM_2 – new speed

$V_2 = V_1 \times (RPM_2/RPM_1)^1$

$V_2 = 800 \times (3000/3500)^1 = 800 \times .857 = 686$ CFM

Pressure Changes As The Square Of The Speed Ratio

For example, a blower is operating at a speed of 3500 RPM and delivering air at 3 psi. If the speed is reduced to 3000 RPM, what is the new pressure?

Let:

P_1 – orginal pressure (3 psi)
P_2 –new pressure
RPM_1 – original speed
RPM_2 – new speed

$P_2 = P_1 \times (RPM_2/RPM_1)^2$

$P_2 = 3 \times (3000/3500)^2 = 3 \times .735 = 2.21$ psig = 83 inches of water pressure

Air Density Varies In Inverse Proportion To Absolute Temperature

For example, a blower is to handle 150 °F air at 40 inches of water pressure. What pressure (standard air) blower is required?

Let:

P_1 – pressure hot air (40 inches of water)

P_2 – pressure standard air

AT_1 – absolute temperature hot air (150+460=610°)

AT_2 – absolute temperature standard air (68+460=528°)

$P_2 = P_1 \times (AT_1/AT_2)$

$P_2 = 40 \times (610/528) = 40 \times 1.15 = 46$ inches of water

Temperature in Degrees of Fahrenheit	% Of Change In Air Density Compared to 70°
100	–5
90	–4
70	0
60	+2
50	+4
40	+6
30	+8
20	+10
10	+13

If a blower is capable of delivering 30 inches of water pressure with standard air, what pressure will it develop handling 150 °F inlet air?

$P_1 = P_2 \times (AT_2/AT_1)$

$P_1 = 30 \times (528/610) = 30 \times .866 = 26$ inches of water pressure

Relation Of Density To Inlet Volume

At high altitudes it is frequently specified that a specific blower must be capable of handling a given volume of "standard air". For example, a blower is to operate at 5000 feet and is to handle 500 CFM of standard air. To determine the equivalent volume of air the blower must handle at the higher altitude:

Let:

V_1 – volume of standard air (500 CFM)

V_2 – volume of thinner air

Hg_1 – barometric pressure sea level (29.92)

Hg_2 – barometric pressure at altitude (24.89 for 5000 feet)

$V_2 = V_1 \times (Hg1/Hg2)$

$V_2 = 500 \times (29.92/24.89) = 601$ CFM of air at 5000 feet altitude

Pressure Varies In Direct Proportion To Density

For example, a blower operating at 80 inches of water with standard air is to be used to handle air having a specific gravity of 0.8. What pressure does the blower create when handling the air?

Let:

Pa – air pressure

Pg – gas pressure

SG – specific gravity of gas

$Pg = Pa \times SG$

$Pg = 80 \times 0.8 = 64$ inches of water

Horsepower Changes As The Cube Of The Speed Ratio

For example, a blower is operating at a speed of 3500 RPM and requiring 5 horsepower. If the speed is reduced to 3000 RPM, what is the new required horsepower?

Let:

HP_1 – original horsepower

HP_2 – new horsepower

RPM_1 – original speed

RPM_2 – new speed

$HP_2 = HP_1 \times (RPM_2/RPM_1)^3$ $HP_2 = 5 \times (3000/3500)^3 = 5 \times .630 = 3.15$ horsepower

Pressure Varies In Direct Proportion To Altitude

At low altitudes in an indoor environment, the small changes in Regenair® Blower performance are usually ignored. At high altitudes, these changes become significant and should not be ignored.

The performance of all regenerative blowers varies directly with changes in air density according to the Fan Laws. These Fan Laws don't apply to our positive displacement pumps. Altitude changes air density as well as air temperature.

All the catalog performance tests for Regenair® Blowers were conducted at an altitude of 635 ft. This makes the Regenair® Blowers capable of 2% more pressure than the nominal advertising indicates. So in predicting changes in performance we should use the 635 ft. altitude as a starting point.

A 10% decrease in air density reduces pressure performance by 10%. For example: if a blower like the R5 produces 110 CFM at 40 inches of water pressure, with a 10% decrease in air density, it will produce this same air flow at 90% of 40" or 36" of water pressure. The open, no duty flow ratings of any of the blower don't change with air density changes. The maximum rated pressure or vacuum changes the most.

For example, a blower is to operate at an elevation of 5000 feet and is to deliver 60 inches of water pressure gage. What pressure at standard air is required?

Let:

PB – pressure (standard air) blower = 60 inches of water

inH_2O – inches of water pressure

PSL – absolute pressure at sea level, inHg. = 29.92 inches Hg.

PA – absolute pressure at altitude, inHg. = 24.89 inches Hg. from table for 5000 feet altitude.

$PB = InH_2O \times (PSL/PA)$

PB = 60 X (29.92/24.89) = 72 inches of water at standard conditions

To determine what pressure a 90 inches of water (standard air) blower will deliver at 5000 feet:

Let:

PD – pressure delivered by a 90 inches of water (standard air) blower

$PD = InH_2O \times (PA/PSL)$

PD = 90 X (24.89/29.92) = 74.9 inches of water

Gast offers a program called "REGPER" that calculates changes in performance at 60 Hz. for changes in altitude or air temperature and the effect of operating with both pressure and vacuum on a blower at the same time. This program can be found on Gast's Web Site, **www.gastmfg.com**; you may also contact your Gast Representative for more information on this program.

Ft. Altitude	InHg	inH_2O	PSIA
0	29.92	406.73	14.69
500	29.39	399.53	14.43
1000	28.86	392.32	14.17
1500	28.34	385.25	13.91
2000	27.82	378.19	13.66
2500	27.32	371.39	13.41
3000	26.82	364.59	13.17
3500	26.33	357.93	12.93
4000	25.84	351.27	12.69
4500	25.37	344.88	12.46
5000	24.89	338.49	12.23
5500	24.44	332.24	12.00
6000	23.98	325.98	11.77
6500	23.53	319.87	11.55
7000	23.09	313.89	11.34
7500	22.66	308.04	11.13
8000	22.23	302.19	10.91
8500	21.81	296.49	10.71
9000	21.39	290.78	10.50
9500	20.98	285.20	10.30
10000	20.58	279.76	10.10

Calculating System Friction Loss

Friction causes pressure loss in all systems. Plumbing design and length affect this loss in air flow.

1. Determine total straight pipe equivalent.
List number of each fitting in system. Circle the column under the supply pipe size. Multiply the number of each item by the pipe size conversion factor to find the equivalent amount of straight pipe. Add equivalent figures to actual straight pipe figures.

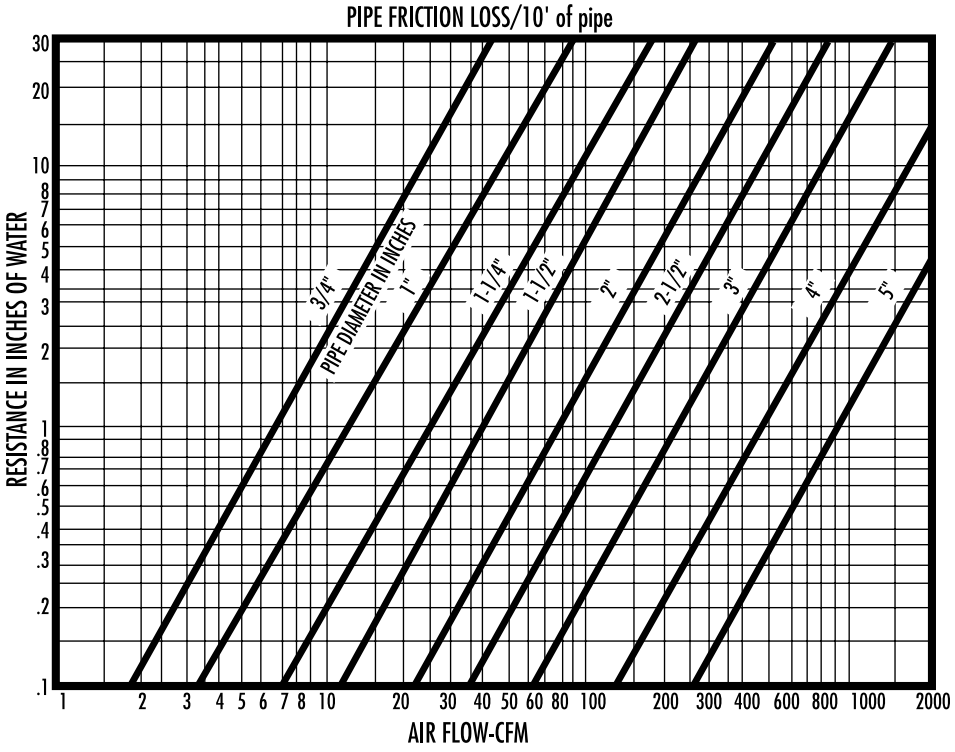
Friction loss in pipe fittings equivalent length of straight pipe

Fitting	#	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	5"	Equivalent Ft.
90° Elbows	___x	2.0	3.0	3.5	4.0	5.0	6.0	8.0	10.0	12.6	=
Std. through tees	___x	1.5	2.0	2.5	3.0	3.5	4.0	5.0	7.0	8.4	=
Std. branch tees	___x	4.0	5.0	7.0	8.0	10.5	12.5	15.5	20.0	25.2	=
Check valves	____x	7.0	9.0	11.5	13.5	17.0	20.5	25.5	34.0	42.0	=
Gate Valves	____x	0.55	0.7	0.9	1.0	1.5	2.0	2.0	3.0	3.4	=

Total length of straight pipe = _____ft.

Total straight pipe equivalent = _____ft.

2. Determine total friction loss in pipe system.
On bottom line of the pipe friction loss chart, mark the air flow needed. Using a ruler, scan vertically from the CFM figure to the diagonal line for the proper pipe size. Mark the intersection and then scan to the left (vertical) axis to find the friction loss figure.



3. Divide the Total straight pipe equivalent from step 1 by 10; multiply by friction loss figure just determined to get the total friction loss in the pipe system.

_____ ÷ 10 x _____ = _____

Total feet of pipe in system Friction loss factor Total friction loss in system in inches of H_2O

Sound Pressure Level Decreases With Distance According To This Formula:

(SPL)2 = (SPL)1 - 20LOG (d2/d1)

Where:

(SPL)2 = New Sound Pressure Level
(SPL)1 = Original Sound Pressure Level
d2 = New distance from sound generator
d1 = Original distance from sound generator

Thus, each doubling of distance results in 6 dBa reduction in Sound Pressure Level

NOTE: this formula assumes that no noise is reflected. In a room that reflects most sound energy (having walls with a low noise reduction co-efficient) much less reduction in noise level with increased distance will be observed than is predicted with this formula.

Noise Q & A

Q. How do I decrease blower noise?

A. Common methods used to decrease blower noise include:

- Having the cover side face where you want the reduction in noise to be and having sound absorbing material diminish sound reflected from the motor side of the blower
- Checking the supporting structure for rattling
- Controlling reflected noise with sound absorbing material
- Moving the blower away from the operator, in another room, possibly in a different area or outside.

Q. Typically how much does the noise output of Gast blowers vary with changes in pressure or vacuum?

A. This varies a lot from model to model with some models little or no change and with others, as much as 9 dBa.

Q. Tyically how much does the noise output of Gast blowers change between 60 Hz and 50 Hz?

A. Generally 50 Hz is 3 dBa quieter than 60Hz but this varies from model to model.

Q. On Gast dual blowers when do I need the large accessory muffler?

A. These blowers provide silencing for either the inlet or exhaust but not both. If, for example, the discharge of the blower is underwater or in some location where the noise passing through the pipe is contained and not objectionable no additional silencer is needed. Where this ringing noise is not contained and noise control is needed, we manufacture accessory mufflers to greatly reduce noise levels.

Q. What happens to the noise when I locate two blowers close together?

A. If the blowers are of the same design they produce sound frequencies that are close together. These may cause a “beating” change in volume of the blower noise. This is because the units are not synchronized. If two small blowers are needed this change in volume can be reduced by moving them further apart. With larger blowers a dual blower with two blowers on one motor will solve this problem.

Q. What causes the noise relief valves make?

A. Air rush through the valve.

Q. How do I control relief valve or bleed off valve noise?

A. Attach AJ121 Series silencer on the port of the relief valve that is open to atmosphere.

Contact Gast at 269-926-6171 or www.gastmfg.com with any further questions you may have on reducing blower noise in your application.

Blower Sound Levels of Gast Blowers

Data is highest sound level out of 4 places around the blower at 1 meter.

Data represents average of several units run at nominal voltage.

Lowest to highest maximum dba level throughout performance range is shown.

Readings at other than the maximum around the blower at 1 meter may be from 2 to 10 dba less than data shown.

Readings taken in a laboratory sound room that does not reflect much noise.

Note: For comparison purposes, some blower manufacturers show sound data from 1–1/2 meters instead of from 1 meter; also, some blower manufacturers show an “average” sound level across performance instead of the full range between minimum and maximum sound levels; either of these methods will provide different and usually lower sound levels compared to Gast’s sound level method.

60Hz	dBa at Pressure	50Hz	dBa at Pressure
R1	59-67	R1	59-64
R2	66	R2	61-63
R3	67-70	R3	63-68
R4	69-73	R4	64-69
R4P	69-75	R4P	64-71
R5	73-77	R5	71-77
R6	73-79	R6	70-79
R6P	82-83	R6P	77-80
R6PP	77-79	R6PP	73-76
R6PS	76-77	R6PS	72-75
R7	82-84	R7	77-79
R7P	77-80	R7P	74-79
R7H	83	R7H	79-81

60Hz	dBa at Vacuum	50Hz	dBa at Vacuum
R1	58-63	R1	54-60
R2	67	R2	63-64
R3	67-71	R3	64-69
R4	70-72	R4	66-70
R4P	73-74	R4P	68-71
R5	75-76	R5	71-73
R6	78-80	R6	74-77
R6P	81-85	R6P	79-81
R6PP	81-83	R6PP	78-79
R6PS	79-81	R6PS	76-77
R7	85-87	R7	79-84
R7P	84-86	R7P	80-83
R7S	82-83	R7S	78-80
R9	85-90	R9	83-84
R9P	88-90	R9P	84-87
R9S	87-88	R9S	83-86
R4H	82-89	R4H	79-88
R4M	85-89	R4M	80-85
R7H	82-91	R7H	80-90
R7S	75-77	R7S	72-76
R9	82-85	R9	78-85
R9P	81-88	R9P	79-86
R9S	79-81	R9S	77-81
R4H	80-82	R4H	75-81
R4M	82-83	R4M	78-79

Gast Manufacturing, Inc.
A Unit of IDEX Corporation
Post Office Box 97
2300 M-139 Highway
Benton Harbor, Michigan 49023-0097
Phone 269-926-6171
Fax 269-925-8288
www.gastmfg.com

Gast Hong Kong
Room 6, 9/F, New Commerce Centre
19 On Sum Street, Shatin
Hong Kong
Phone 852-2690-1008
Fax 852-2690-1012

Gast Group Ltd.
A Unit of IDEX Corporation
Unit 11, The I O Centre
Nash Road
Redditch, B98 7AS
United Kingdom
Phone +44 (0)1527-504040
Fax +44 (0)1527-525262

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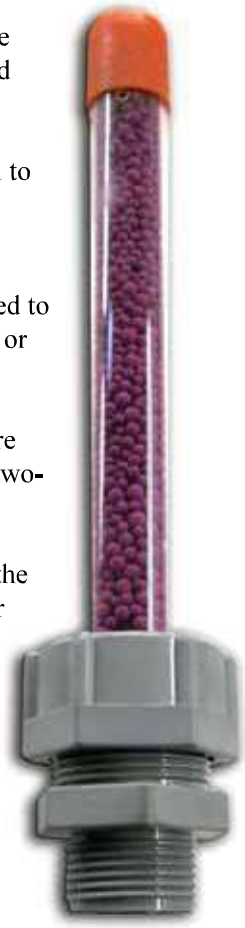
Breakthrough Detector

Activated Carbon Bed Air Stream Sampler

For Detecting Organic Breakthrough in Vapor Phase Applications



TIGG's activated carbon bed Breakthrough Detector is designed for use with vapor-phase NIXTOX® up-flow or radial flow modular activated carbon adsorbers.

The vapor phase carbon bed Breakthrough Detector allows for the air stream to be sampled at a point two-thirds of the way through the adsorbent bed.

It provides a visual signal that the activated carbon bed condition shows free organic or other oxidizable material at that level. This signal may then be used to increase the frequency of exhaust air analysis, replacement of the adsorbent, or the NIXTOX unit.

Breakthrough Detectors for radial flow units function in a similar way, but are externally mounted with a separate sample probe being used to monitor the two-thirds bed depth penetration.

The functional indicator is an oxidizing granular material suspended within the transparent tube. When an oxidizable substance reaches the indicator, a color change from violet to brown/black is clearly visible. A low humidity level is required in the air or gas being monitored for the oxidation reaction to occur. Most organics and some inorganics will react with the oxidant, irreversibly, at varied rates. Since the indicating material will also react in the presence of ultraviolet radiation, an opaque cover shield is provided. The shield is easily lifted to allow for inspection of the detector.

The activated carbon bed Breakthrough Detector offers a number of operational advantages. During operation, the air stream is constantly being sampled. The indicator is on passive "stand-by" until being contacted by some contaminant in the stream. Other advantages are the early warning breakthrough, plus the minimization or elimination of chemical analyses by trained personnel. The Breakthrough Detector is an economical and effective monitoring system.

The Breakthrough Detector is not selective. If a stream contains two or more oxidizable organics with different adsorption potentials, the indicator will react to the organic with the poorest adsorption characteristics. If there is a mixture of organics, and only the better-adsorbed materials are of interest, the detector will provide a premature or false positive signal of breakthrough.

Call a TIGG Representative Today at 800-925-0011

www.tigg.com/breakthrough-detectors.html

TIGG

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TIGG, LLC
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Oakdale, PA 15071

Purifying Air & Water

Econo V - Steel Drum Adsorbers

Modular Activated Carbon Vapor Phase Adsorbers

Solutions for Vapor Phase Remediation & Industrial Emission Control

The Econo - V steel drum activated carbon adsorption system excels at environmental remediation applications and industrial emissions control. This activated carbon adsorption drum is specifically designed fordependable performance and competitive pricing

The Econo - V GAC vapor phase adsorber is constructed of carbon steel and provides a double epoxy/phenolic lining durable enough for environmental remediation applications and industrial emission control

This GAC adsorption 55 gallon drum unit features specially constructed vapor distributors, designed

NOTES:

- Nominal flow can be used in environmental remediation activated carbon applications
- Desired contact time may allow higher or lower flow rates
- TIGG dry reactivated or virgin coal base activated carbon or coconut shell activated carbon provided as standard for environmental remediation applications
- Activated carbon fills are based on a bed density of 27 lb/ft
- Activated carbon fills can difer based on variable bed density and alternate adsorbents

EcONO

Modular Activated Carbon Vapor Adsorber

Model #	Nominal Flow (CFM)	Max Temp	Max Pressure (PSIG)	Inlet/ Outlet	Standard Fill (LBS)	Shipping Weight
EVP-1000	100	200	6	2"	175	225

Call a TIGG Representative Today at 800-925-0011

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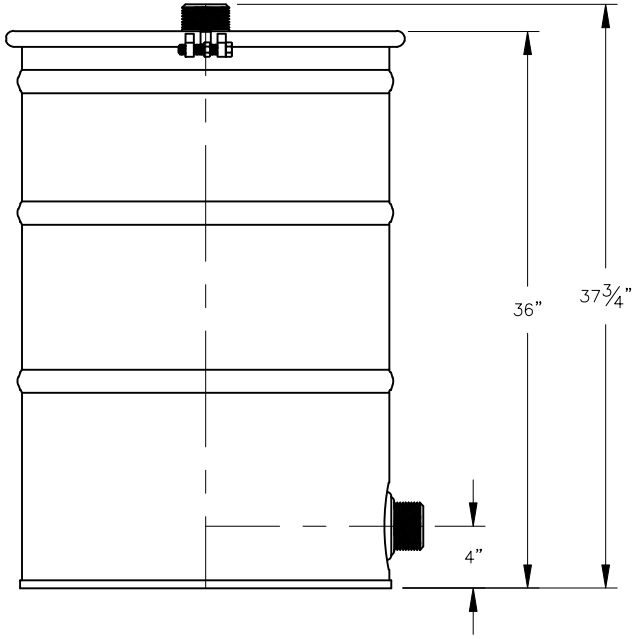
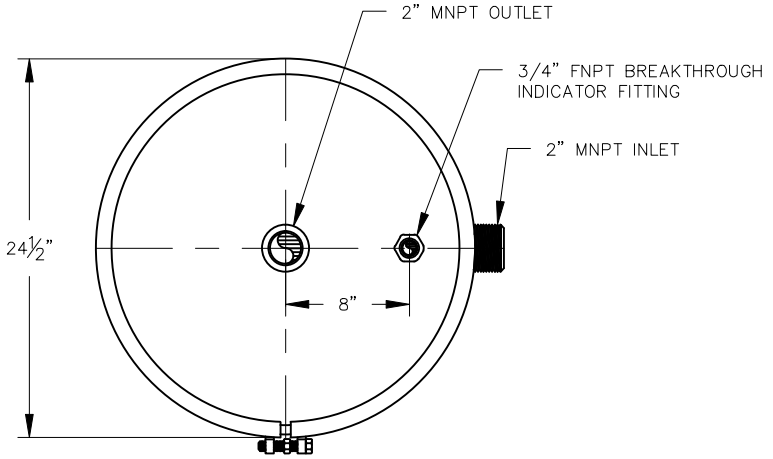


ELEVATION



PLAN

VESSEL STANDARDS

VESSEL MATERIALS : CARBON STEEL	VOLUME OF VESSEL : 7.5 FT^3
LINING : EPOXY PHENOLIC	STANDARD CARBON FILL : 175 LBS
EXTERIOR PAINT : ACRYLIC ALKYD ENAMEL	SHIP WEIGHT : 218 LBS
INTERNALS : STAINLESS STEEL SCREEN	MAXIMUM OPERATING PRESSURE : 6 PSIG
ADSORBENT OUTLET ASSEMBLY : REMOVABLE COVER	MAXIMUM OPERATING TEMPERATURE : 200°F
LIQUID DRAIN ASSEMBLY : N/A	

NO.	REVISION	BY	DATE
3	REMOVE DRAIN	JB	8/1/13
2	REVISE INLET ELEVATION	JB	11/2/06
1	REVISE TITLEBLOCK	JB	6/30/03

PROJECT

ECONOSORB-V

PROJ. NO. SALES

P.O. NO.

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DATE	10/12/99
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TIGG corporation

PLAN & ELEVATION

DWG. NO. ECONOSORB-V-1001 REV. 3

TIGG 5CC 0408

Virgin Vapor Phase Coconut Based Activated Carbon

www.TIGG.com

DESCRIPTION

TIGG 5CC 0408 is a granular activated carbon made from coconut shell. The combination of high activity level and selective transport and adsorption pores accommodates adsorbates of varied molecular size. This activated carbon also contains the high energy adsorption pores which are vital to attaining ultra high removal of low molecular weight volatile organic compounds.

TYPICAL PROPERTIES	TIGG 5CC 0408
U.S. Sieve, 90 wt% min	4 x 8
CCl_4 Number, min	60
Iodine Number, mg/g, min	1150
Apparent Density, (dense packing)	
g/cc	0.41 – 0.42
lbs/ft^3	26
Moisture - wt% max (as packed)	3
Hardness No. - min	98

TYPICAL APPLICATIONS

This activated carbon can be used to:

- Capture solvents
- Remove VOC's from:
  - Tank vents
  - Air stripper off gas
  - Soil venting
  - Remediation of excavated soil

Standard packaging of the activated carbon is in 55 pound bags or 1100 pound supersacks.

Wet drained activated carbon adsorbs oxygen from the air. Therefore, when workers need to enter a vessel containing wet activated carbon, they should follow confined space/low oxygen level procedures. Activated carbon dust does not present an explosion hazard.

CARBONAIR

Temporary Water Treatment Services Carbon • Rental • Service

7500 Boone Ave N, Suite 101, Brooklyn Park, MN 55428 Ph: 800-526-4999 Fax: 763-315-4614 www.carbonair.com

Virgin Granular Coal Based Carbon (Vapor Phase)

Carbonair's virgin granular coal based carbon is manufactured from selected grades of bituminous coal which give high adsorption surface area with a broad pore size distribution (micropore, mesopore, and macropore). This adsorbent media is recommended for treating a variety of organic hydrocarbons in molecular size.

Typical Applications

Soil vapor extraction, air stripper off-gas, VOC control, tank vent, and solvent recovery.

Typical Contaminants

Petroleum hydrocarbons such as MTBE, BTEX (benzene, toluene, ethylbenzene, xylenes), butylbenzene, isopropylbenzene, isopropylether, propylbenzene, styrene, trimethylbenzene, tetraethyl lead (TEL), low molecular weight PAHs (polyaromatic hydrocarbons such as naphthalene, methylnaphthalene) and high molecular wieght PAHs (fluoranthene, phenanthrene, and pyrene).

Chlorinated and brominated hydrocarbons such as bromoform, bromodichloromethane, carbontetrachloride, chlorodibromomethane, chloroform, dibromochloropropane, dichloroethene (DCE), dichloroethane (DCA), ethylenedibromide, trichloroethane (TCA), trichloroethene (TCE), tetrachloroethane, and tetrachloroethene (PCE), and polychlorinated biphenyls (PCBs).

Typical Physical Properties*

Carbon Tetrachloride Number	60% (minimum)
Apparent density (dense packing)	27-31 lbs/ft^3
Hardness Number	95 (minimum)
Moisture Content (as packed)	2% (maximum)
Mesh Size	4x6, 4x10

* Please consult with Carbonair for your specific application.

Granular Activated Carbon (GAC) Information

Granular Activated Carbon (GAC)

Carbonair does not manufacture granular activated carbon (GAC) in house, but has over 25 years of experience in developing techniques that effectively uses granular carbon for water treatment. Carbonair has a large inventory of liquid-phase filter vessels and vapor-phase carbon vessels available for temporary projects. Pre-assembled activated carbon treatment systems on skids and trailers are available for mobility at job sites. Carbonair strictly follows the regulatory guideline for the handling and disposal of the spent carbon. In some cases, the spent GAC can be sent back to reactivation facilities for reactivation and reuse. The applications that Carbonair uses GAC to treat contaminated water and air flows are the following: Liquid Phase Carbon Vessels, Vapor Phase Carbon Vessels.

Questions? Click Here.

What is Granular Activated Carbon (GAC)?

GAC is basically carbon in a granular form, which is made from raw carbonaceous materials such as coconut shells or coal. In the activation process, heat is used to burn off some of the raw materials and produce microscopic pores which are capable of trapping the molecules of contaminants in water or air – so-called "*adsorption*". The activated carbon is then pulverized and sieved into appropriate and uniform particle sizes. Most of *organic* contaminants can be treated by GAC; however, there are a small portion of organic compounds that cannot be effectively treated.

Those organic compounds are either too small or too large in molecular or globular size. Excessively small organic molecules, such as vinyl chloride, methylene chloride, chloromethane, and chloroethane, etc., can get away from being trapped in the carbon micropores. Oils and greases are present in water as globules, which are too large in size to enter the carbon micropores. Most of *inorganic* compounds such as iron, manganese, sulfate, and nitrate, etc. cannot be treated by granular activated carbon. Those constituents are typically present in water as ionized forms, which are strongly bound to and difficult to separate from water.

NATIONAL PIPE & PLASTICS, INC.
American-made products since 1970

Corporate Offices
New York Plant
3421 Old Vestal Road, Vestal, NY 13850
800.836.4350 607.729.9381 Fax: 607.729.6130

PVC Perforated Pipe

Please check/fill-in desired specifications and sign below.

Material

- ☐ ASTM D3034 Sewer SDR35
- ☐ ASTM D3034 Sewer SDR26
- ☐ ASTM D1785/D2665 SCH40
- ☐ ASTM D1785/D2665 SCH80
- ☐ Special: _____.

_____.

Pattern

- ☐ Standard
- ☐ ASTM F-758 / AASHTO M278
- ☐ Special

Special Pattern

Hole Size: _____.

Hole Spacing: _____.

Hole Rows: _____.

_____.

Sizes: _____. **Length**: _____.

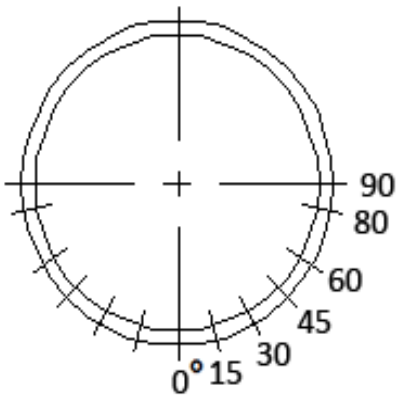
Signature: _____.

Standard Pattern (per ASTM D2729)

Nominal Pipe Size	Hole Size	Hole Spacing	Hole Rows
4" - 6"	1/2"	5" ± ¼"	2 @ 120° (± 5°)
8" - 15"	7/8"	6" ± ¼"	2 @ 120° (± 5°)

ASTM F758 / AASHTO M278 Pattern

Nominal Pipe Size	Hole Size	Hole Spacing	Hole Rows
4"	3/8"	3" ± ¼"	2 @ 90° (± 3°)
6" - 10"	3/8"	3" ± ¼"	2 @ 90°, 2 @ 160° (± 3°)
12" - 15"	3/8"	3" ± ¼"	2 @ 90°, 2 @ 120°, 2 @ 160° (± 3°)



NATIONAL'S sewer (D3034) and DWV (D2665) PVC pipe is manufactured from a PVC compound with a cell class of 12454, as defined in ASTM D1784, and meets the standard specifications of ASTM D3212, if integral gasketed joints are provided. Gasket material conforms to the requirement of ASTM F477.

Standard pipe lengths for sewer are 14', and for DWV 20'. Other lengths are available upon special request.

Updated 03-26-2014

Image represents gauge type

Ashcroft (http://store.flw.com/brands/Ashcroft.html)

ASHCROFT TYPE 1490 LOW PRESSURE DIAPHRAGM GAUGE 0-200 IN H2O VACUUM 25-1490-A-02L-200IWV

~~$52.92~~ $47.63

Are you buying in volume? Are you an OEM? Are you a reseller? Be sure to contact FLW directly for your special pricing.

QUANTITY:

1

AVAILABILITY:

1 in stock.

PART NUMBER:

25-1490-A-02L-200IWV

SHIPPING WEIGHT:

1.00 LBS

SHIPPING:

Calculated at checkout (/terms-and-conditions/#shipping)

All orders outside the United States must be placed directly with an FLW product specialist. **Click for contact details. (http://store.flw.com/contact/)**

Add To Cart

Description

Specifications

Literature

Description

The Ashcroft® Type 1490 low pressure diaphragm gauge is designed to measure pressure from 10 in.H2O to 15 psi, both positive and negative pressures. This gauge uses a very sensitive diaphragm capsule to measure low pressure and vacuum. The gauge is specifically designed for use whenever the pressure medium is a gas that is not corrosive to beryllium copper, brass, polysulfone and RTV silicone. The polysulfone case is suitable for intermittent or continuous service on natural gas provided a .013" throttle plug is installed in the socket. Typical applications are, but not limited to, vacuum pumps, gas leak detectors, air compressors, air filters, gas burners, gas measurement, vacuum ovens, suction regulators and respirators.

Features:

- 2.5" and 3.5" dial size
- Glass-filled polysulfone case material, won't rust or dent
- Beryllium copper diaphragm
- Brass socket
- Wetter material of beryllium copper, brass, polysulfone and RTV silicone
- Exclusive autoclavable feature

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GO TO GEOTECH

Remote Communications for Remediation Systems

geotech

Geotech Environmental Control Module (GECM) with Telemetry

Stay in touch with deployed remediation systems via SMS (text message) Telemetry embedded within Geotech Environmental Control Modules. Systems with Telemetry are optimized for simple send and receive queries that make remote sites convenient to monitor.

HOW IT WORKS

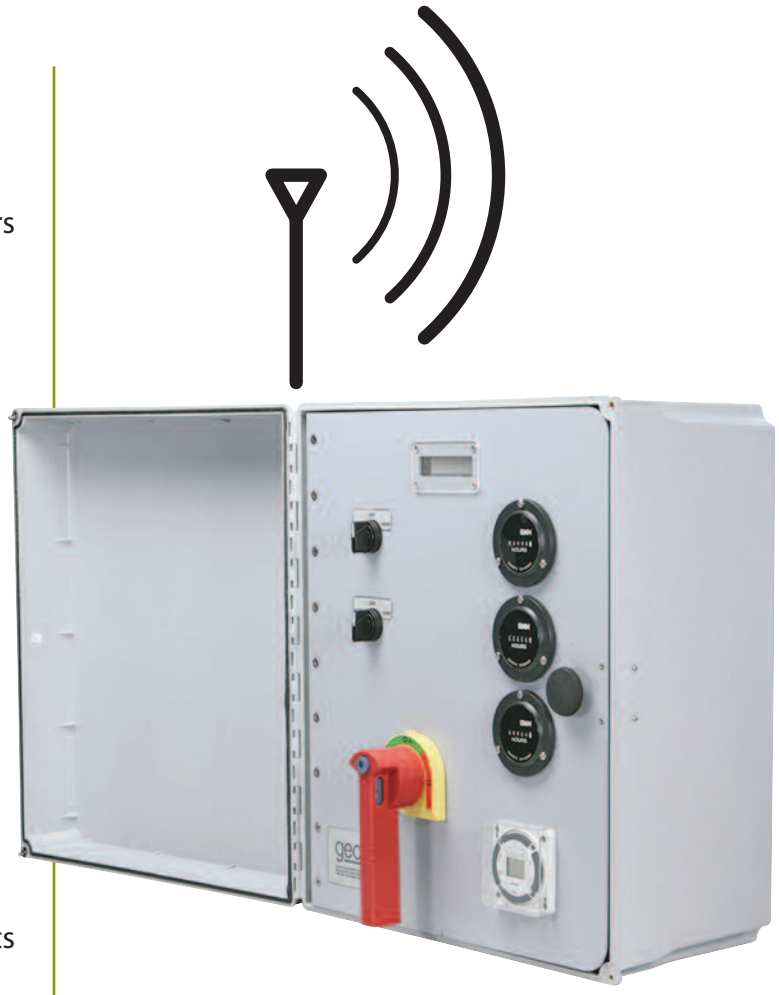
Each control panel can be programmed with several phone numbers. When the system enters into an alert condition (fault), the programmed numbers will be notified through text message.

In addition, the control panel may be queried for status updates and to respond to alert conditions via simple commands.

Examples of Telemetry Queries:

- Current operating status and check-in.
- Power status (outage and/or restart).
- Add additional phone numbers for alerts.
- Change timer settings.
- Investigate runtime, cycle counts, faults, etc.
- Enable/disable individual channels.

Systems are connected through a cellular network and accounts are managed through Geotech. Costs will depend on size of systems, frequency of alert conditions and commands, and location relative to cellular service. Antenna types will depend on location and proximity to cell towers.



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2650 East 40th Avenue • Denver, Colorado 80205
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email: sales@geotechenv.com website: www.geotechenv.com

geotech_ecm_telemetry.qxp 02/25/15

Remote Communications for Remediation Systems

Geotech Environmental Control Module (GECM) with Telemetry

Text Message examples of remediation systems with embedded Telemetry

Geotech Sipper (AC or Solar*):

Text Message Alerts	System Query
SPPR: TANKFULL	**Prompt >** SYSTEM STATUS?
SPPR: OVERRIDE	RUNTIME: dd:hh:mm
SPPR#: WATER DETECTED	CYCLE COUNT: nnnnnn
SPPR: ELEC LOW TEMP	TEMPERATURE: 78 F
	*BATTERY VOLTAGE: 12V
*	CHARGE STATUS: *charged* *charging* *low power shut down*

Other Remediation Systems with GECM:

Remediation equipment which is accompanied by a Geotech Environmental Control Module (GECM) will have the option to embed Telemetry capabilities for remote monitoring. See generic examples of alerts and queries for remediation equipment.

Text Message Alerts include:	System Query
SYS: HI TEMP	**Prompt >** SYSTEM STATUS?
TANKFULL	SYSTEM RUNNING
OVERRIDE	SYSTEM FAULT
PROBEFAULT	TEMPERATURE: 78 F
HI VACCUUM	**System Commands**
LO VACCUUM	**Prompt >** ADD PHONE
HI SUMP	**Prompt >** STOP SYS#
H2O IN RES	**Prompt >** CURRENT FAULT
ELEC LOW TEMP	**Prompt >** CHANGE TIMER

Consult your Geotech Service Representative regarding custom Geotech Telemetry capabilities for all your remediation needs.

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Geotech Environmental Control Module

Installation and Operation Manual

Rev 06/06/2017 Part # 16110163

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DOCUMENTATION CONVENTIONS

This manual uses the following conventions to present information:

An exclamation point icon indicates a **WARNING** of a situation or condition that could lead to personal injury or death. You should not proceed until you read and thoroughly understand the **WARNING** message.

A raised hand icon indicates **CAUTION** information that relates to a situation or condition that could lead to equipment malfunction or damage. You should not proceed until you read and thoroughly understand the **CAUTION** message.

A note icon indicates **NOTE** information. Notes provide additional or supplementary information about an activity or concept.

Section 1: System Description

Overview

The Geotech Environmental Control Module (GECM) is a microprocessor-based industrial control panel for the operation of remediation and industrial equipment including, but not limited to Geotech branded equipment.

The GECM is designed for installation in an unclassified location, with Intrinsically Safe (IS) circuit extensions into hazardous (classified) locations.

The GECM has also been designed for ease of use and installation; a single panel can accommodate a wide variety of equipment control needs. A standard panel is capable of controlling up to eight devices from 24 IS probe inputs. Devices can vary from small signal relays to 75 HP motor starters. A panel can be easily expanded to accommodate up to 32 additional outputs and 96 additional IS probe inputs. This equipment should be installed in accordance with NEC NFPA 70.

How the GECM works

The GECM uses highly flexible microprocessor based electronics to provide a wide spectrum of capabilities that range from basic motor control to complex and sophisticated multi-panel networking. This built in versatility allows the GECM to be configured to match the unique requirements of a vast variety of industrial and remediation equipment control.

Basic motor control is achieved by use of magnetic motor starters. All standard motor starters have built in over current protection. More sophisticated motor control techniques can be achieved by use of a Variable Frequency Drive (VFD) that can interface directly with the GECM.

General Description

The GECM has a wide variety of capabilities for automatically controlling electrical environmental remediation equipment. Site-specific needs can be met on an individual basis from a single flexible platform.

Panels include a varied configuration to operate the following equipment:

- Geotech Small Diameter Filter Scavenger (SDFS) with 12VDC product pump
- Geotech Small Diameter Probe Scavenger (PSCAV) with 12VDC product pump
- Water Table Depression Pumps (WTDP) up to 75 HP
- LOPRO II and III Air Stripper blowers up to 75 HP
- Soil Vapor Extractor (SVE) blowers up to 75 HP
- Air Sparge Compressors up to 75 HP
- Transfer Pumps up to 75 HP
- Equipment up to 75 HP

Figure 1-1: Example of a GECM with SVE-HAZMAT system

Features and Options

The GECM is available with a host of options to accomidate site needs and customer preference.

- All components are housed in an easy to install weatherproof NEMA 4X (IP66) enclosure.
- A bright 16 x 2 character Vacuum Fluorescent Display (VFD) shows users exactly what is happening with each individual component within the system. For example, a probe's float position or an output device's ON/OFF status can easily be viewed on the display, day or night.
- A 4-button keypad can be used to scroll through menus and status displays.
- Hand-Off-Auto (HOA) switch controls for direct control over individual system devices.
- System run lights and alarm lights, mounted on the panel itself or mounted atop the panel so that a GECM's operational status can be seen from a distance.
- Optional, pre-wired circular connectors are available for probe connections to make installation fast and simple.
- The design incorporates circuitry for wiring extensions into hazardous (classified) locations.
- For lower, short-circuit rated systems, fused disconnect options are available.
- Electro-mechanical runtime meters to track and monitor device active runtime.
- ON/OFF timers for managing time-sensitive systems in community environments.
- Remote monitoring of system faults and status via SMS (text message) telemetry, includes battery backup for power outage alerts.

In addition, each GECM will come with an Installation and Operation Manual containing device specifications unique to the unit's application. A GECM Field Wiring Diagram is also included with each manual. The GECM Field Wiring Diagram illustrates the internal layout of the GECM panel and also contains wiring information pertinent to device installation and troublshooting.

Section 2: System Installation

Inspection

Inspect all components for physical damage. Installing and operating damaged equipment is dangerous and should not be performed. Verify that all components have arrived as per the Sales Order or packing list.

GECM Panel Installation

Even though the GECM electronics are enclosed within a NEMA 4 rated weatherproof box, it is advised that you place your GECM within a sheltered area, protecting the unit from direct exposure to water and sunlight.

Input Power Guidelines

All wiring must be carried out by a qualified electrician and be in accordance with state and local codes. Conduit runs must conform to current U.S. National Electrical Code (NEC). Do not run any power wires within 2” (5 cm) of intrinsically safe (IS) wires or terminals (NEC Article 508 for relevant codes). All equipment and controls are to be installed in accordance with Article 430 and 504 of the NEC

See also the GECM Field Wiring Diagram for specific connections to the back panel and Printed Circuit Board (PCB). Geotech provides a detailed Field Wiring Diagram with every GECM built. Copies of these diagrams can be obtained from Geotech when needed.

Access Ports and Conduit Hubs

To facilitate wiring, Geotech installs access ports and conduit hubs to the GECM enclosures that are hard mounted to the system being manufactured, i.e., a LOPRO or SVE. A GECM enclosure will not have this wiring option when built and shipped separately.

When installing a GECM enclosure ensure that ports installed for IS wiring are placed within the upper sides of the enclosure (close to the PCB) and that all conduit hubs for main power, blowers, and pumps are installed along the bottom. To maintain the NEMA 4 weatherproof characteristics of your panel use weatherproof conduit hubs.

Install Chassis Ground

Before beginning the panel hookup procedures, run a wire from the bottom ground lug on the GECM back panel to a good earth ground, i.e., the circuit breaker panel enclosure.

Install IS Ground

Connect IS ground wires to the upper ground lug on the GECM back panel.

Wire Main Power

The GECM can be built to operate with 115VAC/1PH, 230VAC/1PH or 3PH (or a combination of both 1PH and 3PH), or 460VAC/3PH. Incoming power leads are normally connected to either a terminal strip or fused disconnect labeled L1 and L2 (single phase applications) or L1, L2 and L3 (three phase

applications). When a fused disconnect is installed for three phase power to the motor starters, Geotech will complete all wiring on the GECM side of the components.

The following wiring descriptions are for standard GECM configurations. In conjunction with the GECM Field Wiring Diagram, always refer to the system diagrams and labels found within the device User Manuals, including those diagrams provided with custom built panels.

Install Incoming Power to Motor Starters

Most motor driven devices controlled by the GECM (LOPRO, SVE, Sparge, WTDP, Transfer Pump) require the use of a motor starter. Motor starters are installed to the back panel when the GECM is built. Run main power for the individual motor starters through the bottom of the enclosure. Each motor starter is labeled for the device they support. Refer to the wiring diagram for specific terminal connections. Attach all ground wires to the ground lug at the bottom of the panel.

DO NOT run power wires within two inches of IS wiring or terminals.

Installing Blower Thermals

The GECM incorporates thermal overload protection for those motors which are equipped. When a motor manufacturer provides thermal overload protection there will typically be two additional wires within the motor's electrical box labeled "J". These wires will run through the same port used for the motor power and are connected to the intrinsically safe PCB terminal, normally labeled THERMALS.

Installing an 115VAC/230VAC to 12VDC Power Supply

Geotech provides 115VAC and 230VAC Power Supply's which are needed to operate the 12VDC product pump motors contained within SDFS and PSCAV systems. Power requirements and control are dependent upon the GECM and are probe activated.

The GECM back panel will contain labeled relays with terminal strips (labeled PRODUCT PUMP) from which hot leads will be connected. These leads will then go to a designated power supply box and be converted to 12VDC for product pump operation.

Power supply boxes should be installed as near to the well as possible to reduce DC line loss in the cable connecting the product pump to the box.

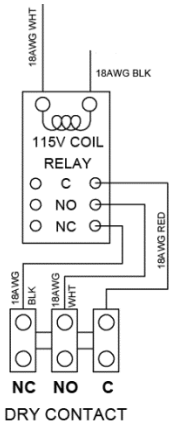
Use the GECM Field Wiring Diagram to complete all wire connections between the GECM and the power supply box.

Installing and implementing a Dry Contact

The GECM is equipped with a Dry Contact which will change state when the GECM encounter's a fault condition. This is useful if there is an influent or effluent system that is not controlled directly by the

GECM but is part of the process flow and needs to be alerted when the GECM's devices shutdown Example of this includes an influent pump for a LOPRO Air Stripper system, or an air sparge system that can not run if the SVE has shutdown.

The Dry Contact relay is connected to a 3-position terminal strip labeled NO (normally-open), NC (normally-closed), C (common); the user may choose if NO or NC is be suited for their application. See Figure 2-1 for example of a standard dry contact configuration.



115V Coil Relay: CSA Load Rating

Res.	10A	240VAC
	10A	30VDC
Gen. Use	7.5A	120VAC
	7A	240VAC
	7.5A	30VDC
	1/6HP	120VAC
	1/3HP	240VAC

Figure 2-1: Diagram of Dry Contact

IS Wiring Installation Guidelines

The GECM incorporates circuitry for IS circuit extensions into hazardous locations. All IS wiring must be at least 2" (5 cm) from all other non-IS wiring. All IS wire terminations must be securely tightened in screw terminals on the GECM PCB.

It is recommended that you use only Geotech supplied probe cable (P/N ORS418005) for IS wiring and Geotech supplied IS float probes with jacketed cable. The maximum length of a Geotech probe cable that can be connected to IS circuitry is 500' (152 m).

Wiring Reservoir, Tankfull, Sump and Water Pump Probes

These devices are wired to designated ports on the GECM PCB and are defined on the GECM Field Wiring Diagram provided. Wiring diagrams for the various equipment probes and devices can be found within the user manuals for the device they support. Common probes built by Geotech support the operation of the following devices:

Reservoir Probe	SDFS
Water Pump Probe	WTDP Motors and Transfer Pumps
Tankfull Probe	SDFS and PSCAV
Sump Probe	LOPRO II and III Air Strippers
3 Position Probe	SVE and Custom Devices

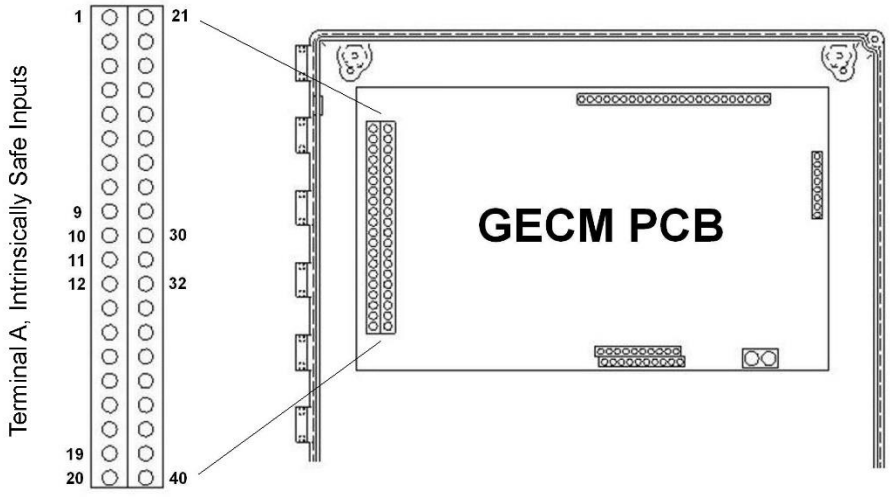


Figure 2-2: Diagram of IS input terminal on GECM PCB

Using a MeLabs Field Programmer

If for any reason the GECM needs to undergo a firmware update, Geotech will provide the new software on a MeLabs Field Programmer. Follow the instructions below to successfully update the GECM.

1. Verify SD card is properly inserted into card slot. Press the back of the SD card to ensure it is inserted as far as it will go. There will be a click to release or lock the card in.
   ** Do this a couple time to verify the card is in proper position. A small portion of the card will stick out from the end of the programmer housing.*
2. Open GECM door and inner panel to gain access to controller board.
3. Remove the PCB Enclosure using a 5/16” wrench/nut driver or #2 Philips screwdriver.
4. At the top near the middle will be a 6 pin jack
   ** Black phone jack like housing.*
5. Plug the cable of field programmer into the jack.
6. With power applied to the unit the LED will be lit up GREEN.
7. Press the program button on the face of the field programmer.
8. During programming LED will be a solid RED.
   **If LED Flashes RED call Geotech at 1-800-833-7958 or 303-320-4764.*
9. When programming is completed the LED will return to a solid GREEN.
10. Remove cable from controller board, reinstall the PCB enclosure and close up the GECM.

Unit is now ready for use.

Section 3: System Operation

User Interface

Display & Keypad

Each GECM is equipped with a 16 x 2 character, extended temperature Display. Information regarding device status, probe levels (when applicable), and any alarm conditions are displayed. In an alarm condition, the display readout will show the most recent fault which halted system operation. Once fault condition is corrected the red RESET button can be pressed to resume system operation.

A 4-button keypad enables menu and scroll views on the Display for all systems. Continued scrolling will provide access to various information and diagnostics screens and allows for the telemetry module to be configured and enabled/disabled. The keypad will provide an indepth view of how the system is operating.

Custom panel application displays may vary according to customer requirements. Any custom display definitions will be included within the device specific GECM manual. Equipment status and alarm condition displays are specific to each panel and its required control application.

A list of standard displays and their definitions can be found in *Section 4: Display Definitions* of this manual. A description of the abbreviated display responses/acronymns can be referenced in Appendix B.

HOA Switches & Indicator Lights

In addition to a Display and 4-button keypad, the GECM will provide HAND/OFF/AUTO (HOA) switches that control each device.

HAND has a spring return and must be held in position to directly power the device, regardless of switch input.

OFF will shutdown all controls and automation to the specific device. The GECM will remain powered on.

AUTO latches the hardware and will run the device autonomously with inputs from various switches.

Figure 4-1: Example of a HAND/OFF/AUTO (HOA) Switch

AUTO should be used normally, but HAND may be used to verify device operation, i.e.: “bumping” the device motor.

To “bump” a device’s motor when the GECM is in a fault condition, adjust device’s HOA switch to OFF position, then press the RESET button. HAND will now be active and will help to ensure devices are still in operational condition.

In the case of a fault condition where both devices are powered down, AUTO will provide no device power.

RESET Button

Each GECM is designed to automatically shutdown the system and associate devices whenever a fault condition occurs. Once the fault or condition has been corrected the system can be easily turned back on by pressing the red RESET button. This will clear the firmware fault and automatically turn on any equipment still set to AUTO. If you do not want a given device to turn back on, then set the appropriate switch to OFF prior to using the RESET button.

Momentarily pressing the RESET button may also restore a blank or faulty display. However, contact Geotech should display problems occur that will not clear up with this method.

Telemetry Enable/Disable and Configuration

Stay in touch with deployed remediation systems via SMS (text message) Telemetry embedded within any GECMs. Systems equipped with Telemetry are optimized for simple send-and-receive queries that make remote sites convenient to monitor.

Each control panel can be programmed with up to 5 cell-phone numbers. When the system enters into a fault condition, the programmed numbers will be notified through text message. POWER ON and POWER OUTAGE alerts are facilitated by an incorporated short-life battery backup.

In addition, the control panel may be queried for operating status updates. Custom queries and configurations are available depending on site requirements. The unit must be powered on and the specified antenna connected to facilitate successful communication.

Systems are connected through a cellular network and accounts are managed through Geotech. Costs will depend on size of systems, frequency of alert conditions and commands, and location relative to cellular service. Antenna types will depend on location and proximity to cell towers.

A list of standard messages and their definitions can be found in *Section 4: Display Definitions* of this manual. A description of the abbreviated display responses/acronymns can be referenced in Appendix B.

Setup Steps:

1. From the MAIN screen, place all HOA switches into the OFF position.
2. Press the RESET button to clear the GECM and its display of any fault conditions.
3. Simultaneously hold the LEFT & RIGHT arrow buttons on the 4-button keypad to enter into the Factory Setup menu.
4. Use the flow chart (Figure 4.2) to enable and configure, or disable telemetry settings.

Once configured, using the UP/DOWN arrows on the keypad will display the programmed phone numbers.

Disabling Telemetry through the Factory Setup menu does not affect the cellular service plan, but is rather useful when installing/testing/troubleshooting Please contact your Geotech Customer Service Representative for all cellular plan service details.

Geotech GECM Telemetry User Interface Flow Chart

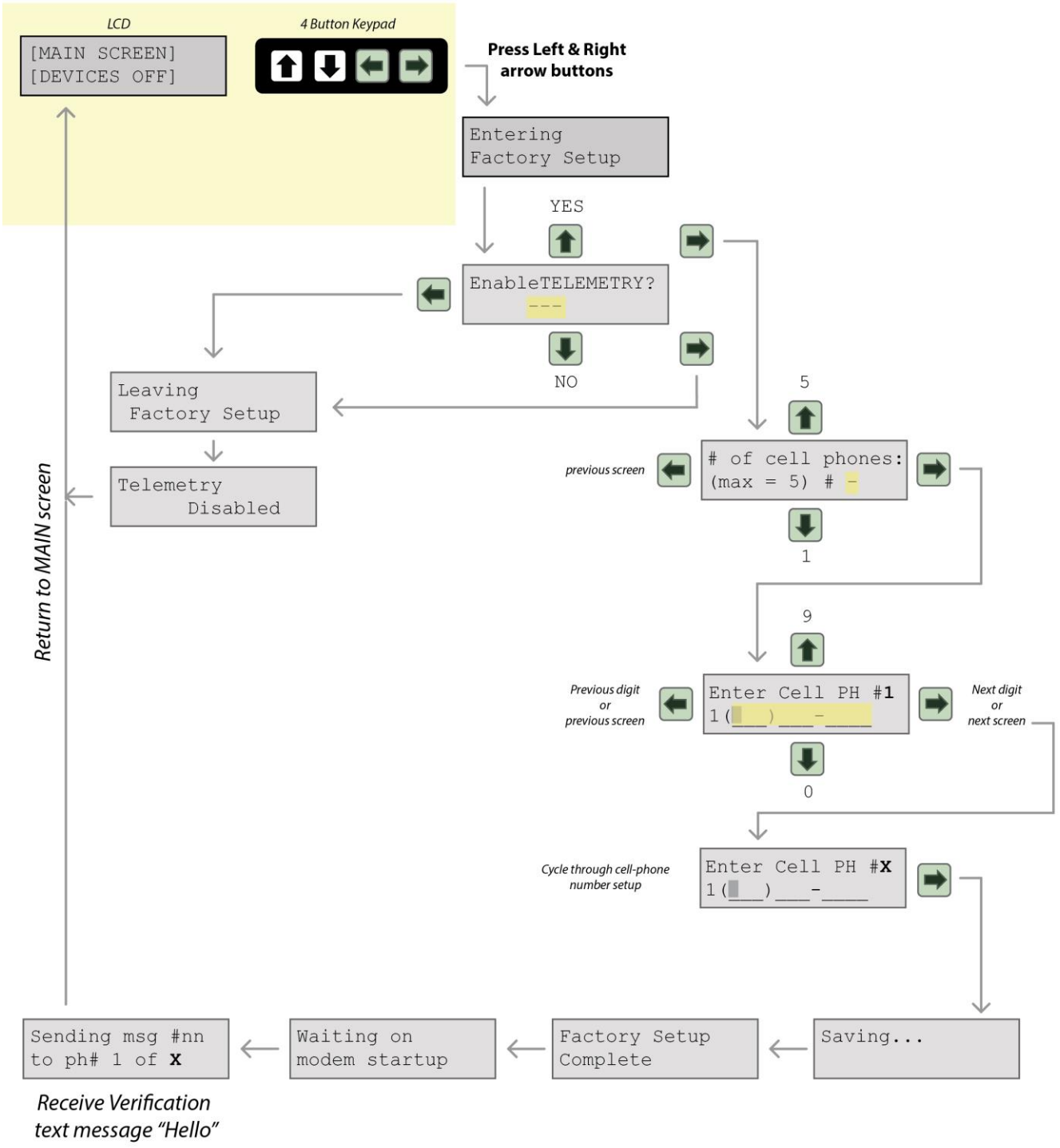


Figure 4-2: Telemetry Enable/Configure User Interface flow chart

Section 4: Display Definitions

The following pages describe status and fault displays used in a standard GECM configuration. Status and fault displays generated for unique GECM/system configurations will be further detailed within the customer's Logic Description and individual device manual.

The following displays are common to the equipments shown. System status, condition and fault messages are shown on Line 1 of the display preceded by the system name and unit # (when there are two or more of the same device). A device status will then be displayed on Line 2.

Fault and condition messages will require a system inspection and that the device be RESET at the GECM. Use this section, in conjunction with the individual device manual, to troubleshoot any fault or condition messages.

A GECM controlling more than one system configuration will take advantage of up/down arrow buttons to review individual system displays.

SDFS/PSCAV Displays –

Line 1 messages:

`HAND:Px H2Ox ORx`	
`AUTO:Px H2Ox ORx`	
`AUTO: TANKFULL`	(condition)
`AUTO: H2O IN RES`	(fault - SDFS only)
`AUTO: OVERRIDE`	(fault)
`AUTO:PROBE FAULT`	(fault)
`AUTO: AUX ALARM`	(fault)

Line 2 messages:

`PRODnnnn H2Onnnn`

Where

x =H (high), M (middle), or L (low)
nnnn = ON, OFF or HAND

Multiple SDFS/PSCAV Systems -

Line 1 messages:

`SDFS SYSTEM #`	or	`PSCAV SYSTEM #`	
`SDFS#: TANKFULL`	or	`PSCV#: TANKFULL`	(condition)
`SDFS#:H2O IN RES`			(fault - SDFS only)
`SDFS#: OVERRIDE`	or	`PSCV#: OVERRIDE`	(fault)
`SDFS#:PROBEFAULT`	or	`PSCV#:PROBEFAULT`	(fault)
`SDFS#: AUX ALARM`	or	`PSCV#: AUX ALARM`	(fault)

Line 2 messages:

```
PRODnnnn H2Onnnn
```

Where

# =1, 2, 3 or 4 (SDFS/PSCAV number)
nnnn = ON, OFF or HAND

Additional Messages for Multiple SDFS/PSCAV Systems -

`SDFS#: LEVELS`	or	`PSCAV #: LEVELS`	(fault)
`OVERRIDE`	or	`OVERRIDE`	
`SDFS#: LEVELS`	or	`PSCAV #: LEVELS`	(fault)
`PROBE FAULT`	or	`PROBE FAULT`	
`SDFS#: LEVELS`	or	`PSCAV #: LEVELS`	
`Px H2Ox ORx`	or	`Px H2Ox ORx`	

Where

# = 1, 2, 3 or 4 (SDFS/PSCAV number)
x = H (high), M (middle), or L (low)

WTDP Displays –

Line 1 messages:

`WTDP: H2Ox ORx`	
`WTDP: OVERRIDE`	(fault)
`WTDP: PROBEFAULT`	(fault)
`WTDP: AUX ALARM`	(fault)

Line 2 messages:

```
WATER PUMP nnnn
```

Where

x =H (high), M (middle), or L (low)
nnnn = ON, OFF or HAND

LOPRO Displays -

Line 1 messages:

`LOPRO: HI VACUUM`	(fault)
`LOPRO: LO VACUUM`	(fault)
`LOPRO: Lx Hx`	
`LOPRO:PROBEFAULT`	(fault)
`LOPRO:HI SUMP`	(fault)
`LOPRO: AUX ALARM`	(fault)

Line 2 messages:

`BLWRnnnnXFERnnnn`

Where
x =H (high), M (middle), or L (low)
nnnn = ON, OFF or HAND

SVE Displays –

Line 1 messages:

`SVE: SYSTEM OFF`	(SVE is OFF but can be run in HAND)
`SVE: SYSTEM AUTO`	(SVE running in AUTO)
`SVE: HI VACUUM`	(fault)
`SVE: WATER HI`	(condition)
`SVE: PROBE FAULT`	(fault)
`SVE: AUX ALARM`	(fault)

Line 2 messages:

`BLWR nnnn`

Where
nnnn = ON, OFF or HAND

SVE with Transfer Pump and 3-position probe Displays –

Line 1 messages:

`SVE: Lx Hx`	
`SVE: PROBE FAULT`	(fault)
`SVE: PRB DETECT`	(fault)
`SVE: WATER HI`	(condition)
`SVE: HI VACUUM`	(fault)
`SVE: HI TEMP`	(fault)
`SVE: BLWR THERM`	(fault)
`SVE: XFER THERM`	(fault)

```
SVE: TANKFULL          (fault)
SVE: AUX ALARM         (fault)
```

Line 2 messages:

```
BLWRnnnnXFERnnnn
```

Where
x =H (high), M (middle), or L (low)
nnnn = ON, OFF or HAND

SVE with Sparge Displays –

Line 1 messages:

```
SVE: SYSTEM OFF        (SVE and Sparge are OFF, either unit can be run in HAND)
SVE: SYSTEM AUTO       (SVE is running in AUTO – with or without Sparge)
SVE: HI VACUUM         (fault)
SVE: WATER HI          (condition)
SVE: PROBE FAULT       (fault)
SVE: AUX ALARM         (fault)
```

Line 2 messages:

```
BLWRnnnnSPRGnnnn
```

Where nnnn = ON, OFF or HAND

Sparge Displays –

Line 1 messages:

```
SPRG:SYSTEM OFF        (Sparge is OFF but can be run in HAND)
SPRG:SYSTEM AUTO       (Sparge running in AUTO)
SPRG:HI PRESSURE       (fault)
SPRG:HI TEMP           (fault)
SPRG:DRY CONTACT       (fault)
SPRG: AUX ALARM        (fault)
```

Line 2 messages:

```
BLOWER nnnn
```

Where nnnn = ON, OFF or HAND

HAND indicates that a device is in manual operation.
Once corrected, the RESET button must be pressed to clear any occurring faults or conditions.

Telemetry Messages on GECM Display -

Each GECM unit equipped and enabled with Telemetry will send a text message to the programmed phone numbers for every condition and fault for the specific device listed in the previous pages. The battery backup will send an additional “Power On” and “Power Outage” text message to inform the user of power status. Additional display and details correlating to the Telemetry package are listed below. Custom units may have varying Display and Telemetry alerts.

Startup sequence:

```
Waiting on Modem
Startup
```

This indicates the modem is going through initiation routines and connecting to the cellular network. This will happen every time the system is powered on, and when telemetry is enabled through the keypad.

Sending SMS alert:

```
Sending msg #--
To phone [x] of [X]
```

This indicates the modem is currently sending a message to programmed phone numbers. Text messages correspond to the device and display definitions listed in the previous pages.

Receiving SMS Query:

```
Query [x] match
```

This indicates the modem has successfully received a query text message. This screen is followed by the “Sending SMS alert” display which is responding to the query.

System’s response to text message “STATUS?” (case sensitive):

`System Standby`	System On, all HOA switches in the “OFF” position
`System Running`	One or all HOA switches in the “ON” position
`System In Alarm`	System experiencing fault, see last message received

If GECM is not responding to query messages, check that power is ON and that the antenna is attached. Damaged antennas should be replaced as soon as possible.

Section 5: Troubleshooting Guide

Use this section, in conjunction with *Section 4: Display Definitions*, to troubleshoot any system problems.

The RESET button must be depressed to clear a system fault or condition. This will also automatically restart any devices still set to AUTO.

No Apparent Power to the GECM –

- Check all incoming wire connections.
- Check fuses and breakers at power source, refer to wiring diagram. (Fuses can also be found on the GECM PCB. These can blow from a voltage spike or incorrect voltage applied to the GECM. Allow a Geotech technician to service these fuses.)

No Display or non-sensicle alpha-numerics –

- Press RESET button.
- Fuse is blown in the GECM PCB or faulty electronics. Return to Geotech for service.

Blower Will Not Run –

- Check device status on GECM display.
- Check for blown fuses.
- Check wire connections between device and GECM.
- Check motor for over-heating, press RESET button on motor starter if necessary.
- HI or LO vacuum switches preventing unit from starting up.

Transfer Pump Will Not Run –

- Check device status on GECM display.
- Check for blown fuses.
- Check wire connections between device and GECM.
- Check motor for over-heating, press RESET button on motor starter if necessary.
- Check sump and/or three position probe floats and verify that nothing is obstructing their movement.
- Check probe wiring to GECM.
- Pump may have over-amped due to obstruction in flow line. Clear line and restart pump.

Transfer Pump Will Not Shut Off –

- Check sump and/or three position probe floats and verify that nothing is obstructing their movement.
- Check probe wiring to GECM.

High Vacuum Message or Switch Not Working –

- Verify wiring connections between GECM and switch.
- See Troubleshooting Procedures for HI Vacuum conditions in the LOPRO or SVE User Manual.

Low Vacuum Message or Switch Not Working –

- Verify wiring connections between GECM and switch.
- See Troubleshooting Procedures for LO Vacuum conditions in the LOPRO or SVE User Manual.

High Temp Message –

- Verify wiring connections between GECM and switch.
- See Troubleshooting Procedures in Sparge User Manual.

High Pressure Message –

- Verify wiring connections between GECM and switch.
- See Troubleshooting Procedures in Sparge User Manual.

Product Pump Will Not Run –

- Check device status on GECM display.
- Check for blown fuses (especially at power supply).
- Check for a bad relay connection between GECM and power supply.
- Check wire connections between device and GECM.
- Check reservoir probe floats and verify that nothing is obstructing their movement.
- Check that hydrocarbons are still present in well and that the SDFS/PSCAV unit is correctly positioned on the hydrocarbon/water interface.
- Check probe wiring to GECM.

Water Pump Will Not Run –

- Check device status on GECM display.
- Check for blown fuses.
- Check wire connections between device and GECM.
- Check reservoir probe floats and verify that nothing is obstructing their movement.
- Check water level probe floats (when separate water pump in use).
- Check that hydrocarbons are still present in well and that the SDFS/PSCAV unit is correctly positioned on the hydrocarbon/water interface.
- Check probe wiring to GECM.
- Pump may have over-amped due to obstruction, dry running, or damage. Inspect pump and flow route.

Dry Contact Message –

- Check for circuit conflicts between GECM and other devices or switches.
- Have the logic statements and operation of any custom built devices checked.

Probe Fault –

- This error will occur when the HIHI float is in the up position and the HI/LO float is in the down position. Check for free movement on all floats.
- A switch wire may have become disconnected or broken.

Override Message (SDFS/PSCAV) –

- Water override float is down and the HI/LO float is up (PSCAV). Check for free movement on all floats.
- Water override float is down and the intake float cartridge is up (SDFS). Check for free movement on all floats.
- A switch wire may have become disconnected or broken.

H2O In RES Message (SDFS) -

- Water in reservoir. Set Product Pump switch to hand to clear reservoir of water.
- Intake cartridge screen needs to be re-primed to prevent water from entering the screen.
- Unit is being placed below the intake cartridge travel.

Tankfull Message –

- Product recovery tank is full.
- A switch wire may have become disconnected or broken.

Auxiliary (AUX) Alarm Message -

- External system (for example: an influent pump on LOPRO) has sent a dry contact message to the GECM, instructing the GECM to shutdown. Ensure external system's faults are cleared in order to resume normal operation.
- A wire may have become disconnected or broken, check wiring diagram.

Section 6: System Specifications

Electrical:
Operating Power: 10 Watts
Input Voltage: 115VAC (1PH), 230VAC (1PH and 3PH), or 460VAC (3PH)

(See individual device wiring diagrams and manuals for detailed electrical specifications)

Environmental Conditions:
0-104º F (-17.8 - 40º C)
A normal barometric pressure of one atmosphere.

(Enclosure heaters and cooling fans available can extend the temperature range to -30 to 110° F (-34 to 43° C)

Mechanical:
Main enclosure: NEMA 4X (IP66)
Enclosure material: Fiberglass
External height:18” (45.7 cm)
External width:16” (40.6 cm)
External depth:10” (25 cm)
Weight: 15 to 45 lbs (6.8 to 20 kgs) (depending on installed options)

Polyester mounting brackets and stainless steel attachment screws are provided with each enclosure. In some systems, such as a LOPRO III Air Stripper or a system housed insite a Hazardous Materials enclosure, the GECM is pre-mounted to the larger skid assembly. GECMs may be ordered and specified to be “shipped as loose”, however electricial competency will be required for safe site installation.

Section 7: Parts and Accessories

Description	Part #
GECM*	86110004
HOA SWITCH	16110042
INDICATOR LIGHT, GREEN, GECM	16110112
INDICATOR LIGHT, RED, GECM	16110088
SWITCH, ELCTROMECHANICAL, EMERGENCY STOP, NO/NC	19600042
ASSEMBLY, FUSIBLE DISCONNECT, 30AMP, 1PH, CLASS J, TIME DELAY	86110010
ASSEMBLY, FUSIBLE DISCONNECT, 30AMP, 3PH, CLASS J, TIME DELAY	86110005
ASSEMBLY, FUSIBLE DISCONNECT, 100AMP, 3PH, CLASS J, TIME DELAY	86110007
ASSEMBLY, FUSIBLE DISCONNECT, 60AMP, 3PH, CLASS J, TIME DELAY	86110006
METER, HOUR, 115V, 50/60, GECM	16110045
TIMER, 7DAY CYCLE, GECM	16110044
TIMER, EM, 1POLE, 120V, 24HOUR	16110138
FUSE HOLDER ASSEMBLY	2010029
FUSE, .5A, 250V, SLO-BLO	PPE011016
FUSE, 1A, 250V, SLO-BLO	PPE011026
RELAY, 110V, DPDT, 10AMP	PPE014090
RELAY, 230V, DPDT, 10AMP	PPE014091
GECM TELEMETRY MODULE	86200003
ANTENNA, ADJUST, DUCK, 4”	16200013

*GECM base unit does not include motor starters. Motor starters and power supply relays must be specified per system.

Appendix A – Customer and Device Information

Customer Name:

Sales Order Number:

Build Date:

GECM Serial Number:

Voltage/Phase:

Device Name:	Serial Number:	Model Number:

Appendix B - Glossary of Acronyms

AUX	Auxiliary
BLWR	Blower
ECM	Electronic Control Module
GECM	Geotech Environmental Control Module
H2O	Water (when on 1st line of display on SDFS system)
H2O	Water pump (2nd line of message on SDFS/PSCAV system))
H2OL	Water level low (SDFS intake cartridge or PSCAV water HI/LO float)
H2OM	Water level middle (SDFS intake cartridge or PSCAV water HI/LO float)
H2OH	Water level high (SDFS intake cartridge or PSCAV water HI/LO float)
HI	High
HOA	Hand-Off-Auto (switch)
HP	Horse Power
IS	Intrinsically Safe
JB	Junction Box
LH	HI/LO float high (Sump probe, 3 position probe)
LL	HI/LO float low (Sump probe, 3 position probe)
LM	HI/LO float middle (Sump probe, 3 position probe)
LO	Low
LOPRO	Low Profile Air Stripper
ORH	Override float (water) high (SDFS/PSCAV probe)
ORL	Override float (water) low (SDFS/PSCAV probe)
ORS	Oil Recovery Systems
PCB	Printed Circuit Board
PH	Phase (electrical term)
PH	Product float high (SDFS/PSCAV probe)
PL	Product float low (SDFS/PSCAV probe)
PM	Product float middle (SDFS/PSCAV probe)
PSCV	Probe Scavenger (4” Small Diameter PSCAV)
PSCAV	Probe Scavenger (4” Small Diameter PSCAV)
PSI	Pressure per Square Inch
PROD	Product pump
RES	Reservoir (SDFS)
SDFS	Small Diameter Filter Scavenger
SN	Serial Number
SPRG	Air Sparge unit
SVE	Soil Vapor Extractor (Extraction)
VAC	Voltage Alternating Current
VDC	Voltage Direct Current
VFD	Variable Frequency Drive, or Vacuum Fluorescent Display
WTDP	Water Table Depression Pump
XFER	Transfer Pump

DOCUMENT REVISIONS		
EDCF#	DESCRIPTION	REV/DATE
-	Previous Revision	11/7/2011
1544	Added WTDP Display Definitions in Section 3	3/13/2013
1544	Added Field Programmer Instructions in Section 2	10/1/2013
Project # 1518	Updated to include Auxilliary Alarm and Telemetry information, removed test specifications (moved to device specific), general updates, SB	6/6/2017

The Warranty

For a period of one (1) year from date of first sale, product is warranted to be free from defects in materials and workmanship. Geotech agrees to repair or replace, at Geotech's option, the portion proving defective, or at our option to refund the purchase price thereof. Geotech will have no warranty obligation if the product is subjected to abnormal operating conditions, accident, abuse, misuse, unauthorized modification, alteration, repair, or replacement of wear parts. User assumes all other risk, if any, including the risk of injury, loss, or damage, direct or consequential, arising out of the use, misuse, or inability to use this product. User agrees to use, maintain and install product in accordance with recommendations and instructions. User is responsible for transportation charges connected to the repair or replacement of product under this warranty.

Equipment Return Policy

A Return Material Authorization number (RMA #) is required prior to return of any equipment to our facilities, please call 800 number for appropriate location. An RMA # will be issued upon receipt of your request to return equipment, which should include reasons for the return. Your return shipment to us must have this RMA # clearly marked on the outside of the package. Proof of date of purchase is required for processing of all warranty requests.

This policy applies to both equipment sales and repair orders.

FOR A RETURN MATERIAL AUTHORIZATION, PLEASE CALL OUR SERVICE DEPARTMENT AT 1-800-833-7958.

Model Number: _____

Serial Number: _____

Date of Purchase: _____

Equipment Decontamination

Prior to return, all equipment must be thoroughly cleaned and decontaminated. Please make note on RMA form, the use of equipment, contaminants equipment was exposed to, and decontamination solutions/methods used.

Geotech reserves the right to refuse any equipment not properly decontaminated. Geotech may also choose to decontaminate equipment for a fee, which will be applied to the repair order invoice.

Appendix M
Project Schedule

3083 Webster Ave BCP Site_Site Number: C203184
RAWP Implementation Schedule _ 2026-2027

								2027											
Tasks	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
RAWP and RAWP Fact Sheet																			
RAWP Public Comment Period	June 10-30																		
Acquisition of building permits		Jul 11 to 18																	
Remedial Injections		Jul 31 to Aug 7																	
Groundwater Sampling						Nov 27				18-Mar			22-Jun			14-Sep			9-Dec
Site remedial excavation including support of excavation		Jul 20 to Oct 20																	
Installation of basement foundations				Sep 7 to Dec 27															
Installation SSDS system - underground							Dec 13 to Jan 20												
Installation SSDS system - aboveground									Jan 21 to July 26										
Installation of building slab on-grade											Apr 22 to May 10								
SSDS Start-up and indoor air testing															Aug 21 to Sep 10				
Environmental Easement excecution and recording													June 27						
SMP																	Oct 15		
FER Fact Sheet																		Nov 29	
Final FER																			Dec 5
Certificate of Completion																			Dec 20
IC/EC Notice Fact Sheet (within 10 days of Notice)																			Dec 29
Implement of SMP (Operations, Maintenance and Annual Inspections/monitoring of ECs)																			TBD