SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN

Former Kenneth Trading Corp. Facility

11-35 31st Drive, Astoria NY 11106

Block 503, Lot 41

Site ID: C241215

Submitted to:

New York State Department of Environmental Conservation

Division of Environmental Remediation

Remedial Bureau B, 12th Floor
625 Broadway
Albany, NY 12233-7016

Prepared for:

Astoria Riverside Park, LLC

280 N. Central Avenue, Ste.110
Hartsdale, New York 10530

Prepared by:

YU & Associates Engineers, P.C.

611 River Drive, 3rd Floor
Elmwood Park, NJ 07407

October 31, 2025

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CERTIFICATIONS

I, Sixuan Wang, certify that I am currently a NYS registered professional engineer and that this Remedial Investigation 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).

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.



107041 — NYS Professional Engineer #

10/31/2025 — Date

Signature

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.

1.0 INTRODUCTION

Astoria Riverside Park (ARP) LLC entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) in September 2018, to investigate and remediate a 0.23-acre property located at 11-35 31st Drive in Astoria in Queens, New York. A remedial investigation was performed at the 11-35 31st Drive, Long Island City, NY (the Site) to characterize soil, groundwater, and soil vapor contaminations between June and September 2019 by Impact Environmental Closures, Inc. (IEC). IEC subsequently prepared a Remedial Investigation Report (RIR), which was submitted to the New York State Department of Environmental Conservation (NYSDEC or the Department) on July 27, 2020, and approved by the Department in August 2021.

A remedial action work plan (RAWP) was prepared by YU & Associates, Inc. (YU) based on the RIR findings and submitted to NYSDEC in June 2023. On December 5, 2023, NYSDEC provided comments on the RAWP, and, on July 29, 2024, issued a formal request for the submittal of a Supplemental Remedial Investigation Work Plan (SRIWP). A copy of the NYSDEC's request for the SRIWP is provided in Appendix A.

Based on our review of the analytical and field data, and discussions with the Department, YU has prepared this SRIWP for an additional investigation to determine and characterize the extent of contamination in bedrock groundwater and fractures. This SRIWP includes a summary of site history, previous environmental assessments and investigation; a description of site geography and geology information; and a plan for further delineation of contamination on Site. The work will be performed in accordance with Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10), (NYSDEC, May 3, 2010).

2.0 BACKGROUND INFORMATION

2.1 SITE DESCRIPTION/PHYSICAL SETTING/SITE HISTORY

The Site is located in the County of Queens, Astoria, New York and is identified as Block 41 and Lot 503 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 0.23-acre area bounded by multi-story residential apartment building with two-story parking garage to the north, 31st Drive and residential and light industrial buildings to the south, an asphalt paved parking lot and multi-family residential apartment buildings to the east, and an outdoor recreation area to the west (see *Figure 2*).

The Site and surrounding properties are currently zoned R7A: predominantly residential in character. The subject site is surrounded by residential, commercial, and industrial properties including a 22-story apartment building located to the north, a cabinet manufacturer to the south, parking lot and residential buildings to the east, and residential buildings, a vehicle wrapping store and HVAC and kitchen cabinet supplier to the west.

The subject Site was initially developed as early as 1898 and utilized as a residence through at least the 1950s. The original warehouse building was constructed circa 1959 after which the Site was utilized as a commercial facility. A steel works occupied the Site from 1967 to 2010. After which, two commercial transportation companies occupied the Site in 2014. The site is currently vacant.

Prior site uses indicated the presence of a number recognized environmental conditions (RECs), as documented in the Phase I and Phase II investigations conducted between 2007 and 2013. These RECs included aboveground storage tanks (ASTs), underground storage tanks (USTs), aboveground hydraulic lift, and the potential presence of contaminants associated with specific prior site uses, among others.

The Phase I ESA did not indicate any spill cases associated the project site. A review of the New York State Department of Environmental Conservation (NYSDEC) Spill Incidents Database dated July 28, 2025, confirms that there is no open spill cases associated with the Site. The Site is currently vacant and used to consist of a slab-on-grade warehouse structure with no basement and limited subsurface infrastructure. No on-site features such as subsurface utility corridors, floor drains, or sumps have been identified that would promote off-site contaminant migration.

2.2 SUMMARY OF PREVIOUS INVESTIGATIONS

2.2.1 Phase II ESA (December, 2017)

A Phase II Environmental Site Assessment (ESA) was conducted by IEC at the project site in 2017 and confirmed the presence of chlorinated solvent contamination in soil vapor, soil, and groundwater at the site. Soil vapor sampling results indicated elevated detections of tetrachloroethene (PCE) and trichloroethene (TCE). Soil samples showed the presence of PCE above NYSDEC Unrestricted Use Soil Cleanup Objectives (SCOs) in shallow soils beneath the building slab. Other volatile and semi-volatile organic compounds, metals, pesticides, and PCBs were either below Unrestricted Use SCOs or not detected. Groundwater samples collected during the Phase II ESA indicated PCE and TCE were detected at concentrations above NYSDEC Ambient Water Quality Standards (AWQS).

2.2.2 Remedial Investigation (July, 2020)

The Site was investigated in accordance with the scope of work presented in the NYSDEC approved Remedial Investigation (RI) Work Plan dated June 2019 by IEC. The investigation was conducted between June and September 2019. The RI was submitted to NYSDEC on July 27, 2020 and approved by NYSDEC on August 2021.

Based upon the remedial investigation results, surface and sub-surface soils above groundwater level were contaminated with VOCs, SVOCs, PCBs, pesticides and metals throughout the Site. The source of VOC, especially PCE concentrations detected in soil throughout the Site at concentrations exceeding the Residential Use SCOs are likely attributable to the previous on-site operations.

The deep saturated soils below groundwater level were heavily contaminated with PCE in the vicinity of the former dipping tanks area, where the dense non aqueous phase liquid (DNAPL) was present. The source of PCE DNAPL is likely attributable to the previous on-site operations.

Groundwater sample results indicate VOCs (especially CVOCs), SVOCs (PAHs), PCBs (Aroclor-1254), and metals (iron, magnesium, manganese, sodium, and lead) contamination above Class GA groundwater criteria. The source of VOCs contamination is likely attributable to the previous on-site operations. The source of SVOCs and PCBs detected in groundwater could be attributed to

the on-site soil and fill material. Groundwater sample results exceedances are shown on *Figure 3* through *Figure 6*.

CVOCs in soil vapor were detected on-site at elevated concentrations. The elevated CVOCs levels in soil vapor are consistent with the soil and groundwater CVOCs contamination.

3.0 SCOPES AND RANTIONALE OF SUPPLEMENTAL REMEDIAL INVESTIGATION

As per the previous remedial investigation, chlorinated volatile organic compounds (CVOCs) especially tetrachloroethylene (PCE), were detected in on-site groundwater and soils; the highest concentration of PCE in soil was detected at SB-24 at the concentration of 340,000 mg/kg at the 21 – 21.5 feet below ground surface (ft bgs) interval and in groundwater was detected at MW-7S at the concentration of 210,000 µg/L. Bedrock is encountered at the Site ranging from 24 ft bgs to 34 ft bgs. Based on the RI results, a PCE hotspot area for the overburden soil above bedrock has been delineated and shown in *Figure 7*. In order to verify whether CVOCs contamination has been migrating into bedrock, installation of bedrock groundwater monitoring wells and collection of bedrock groundwater samples are hereby proposed to be conducted within and at the downgradient of the PCE hotspot area.

4.0 SUMMARY OF FIELD ACTIVITIES

General field activities include mobilization, implementation of the site-specific health and safety plan (HASP), a geophysical survey, sampling activities, utility clearance procedures, decontamination procedures, and handling of investigation derived waste. Groundwater sampling activities include bedrock monitoring well installation and well survey, well development, and groundwater sample collection. Groundwater sampling protocols are in Section 4.0 and in the field sample plan (FSP) included as *Appendix B*. The quality assurance protocols are in Section 8 and in the quality assurance project plan (QAPP) included as *Appendix C*.

4.1 MOBILIZATION

Following approval of the SRIWP from NYSDEC and notice to proceed with the field work, YU will mobilize necessary materials and equipment to the Site.

4.2 HEALTH AND SAFETY AND COMMUNITY AIR MONITORING

All work outlined in this SRIWP will be conducted in accordance with the Health and Safety Plan (HASP) included as *Appendix D*. Community air monitoring during any ground invasive activities will be performed in accordance with the NYSDOH Generic CAMP and as described in the Community Air Monitoring Plan (CAMP) included as *Appendix E*.

4.3 UTILITY CLEARANCE AND GEOPHYSICAL SURVEY

Prior to the initiation of subsurface borings, a utility mark out will be ordered by the contractor performing the borings. A geophysical survey will be performed using ground penetrating radar (GPR), various utility locators, and ferrous-metal detectors to clear proposed boring locations, locate on-site underground utilities, and identify potential structures within the subsurface. The first six feet of each boring will also be hand-cleared for utility clearance.

4.4 DECONTAMINATION PROCEDURES AND IDW MANAGEMENT

A temporary decontamination area lined with polyethylene sheeting will be prepared on site for use during decontamination of the drilling and test pitting equipment. Water collected from the decontamination of activities will be collected in 55-gallon drums or a bulk tank.

All drilling equipment including the backhoe, bucket, and drilling rig; augers; rods; tools; split spoon samplers; and tremie pipes will be cleaned with a water pressure washing unit between investigation locations. Tools, drill rods, and augers will be placed on polyethylene plastic sheets following pressure washing. Direct contact with the ground will be avoided. The back of the drill rig and all tools, augers, and rods and all other non-dedicated equipment will be decontaminated at the completion of the work and prior to leaving the site.

All non-dedicated hand equipment and tools will be decontaminated using the following procedures:

- Scrub/wash with a laboratory grade detergent (e.g., Alconox);
- Tap water rinse or distilled/de-ionized water rinse; and
- Distilled/de-ionized water rinse.

If equipment is to be stored for future use, it will be allowed to air dry, and then wrapped in aluminum foil or sealed in plastic bags.

General trash generated during the investigation (e.g., packaging materials, personal protective equipment which is not grossly contaminated) will be bagged and disposed as ordinary solid waste.

All investigation-derived waste (IDW) including soil cutting, decontamination water and purged water will be containerized in NYSDOT-approved 55-gallon drums. The drums will be sealed at the end of each workday and labeled with the date, the well number(s), the type of waste, and point-of-contact. The drums will be properly disposed of off-site at a permitted facility following receipt of the analytical results.

5.0 GROUNDWATER INVESTIGATION

The groundwater investigation will be conducted to evaluate the potential for contaminant migration within the bedrock aquifer and to support the assessment of future groundwater remedial options, if warranted. The investigation will include the advancement of bedrock boreholes, downhole geophysical logging and groundwater sampling. The purpose of the geophysical bedrock survey is to characterize the bedrock and any structural features present and to evaluate the movement of water throughout the bedrock regime to identify the potential for contaminant migration within the bedrock groundwater and to help determine the feasibility of potential future groundwater treatment.

As part of the investigation, water level measurements will also be collected from surrounding site boreholes and monitoring wells, including a baseline prior to coring and pumping activities, as well as during any borehole pumping conducted for development or stressed flowmeter testing.

These measurements are intended to assess potential hydraulic connectivity within the bedrock regime.

5.1 BEDROCK WELL INSTALLATION

A total of five proposed bedrock wells (MW-15BR through MW-19BR) will be drilled and installed at the locations shown in *Figure 8*. The rationale for the proposed bedrock well locations is summarized in *Table 1*. The bedrock monitoring wells will be screened from 6 to 16 feet below the competent bedrock encountered. The wells will be developed to remove residual drilling materials and to establish suitable conditions for groundwater sampling.

During bedrock coring, continuous rock cores will be collected for visual logging and lithologic characterization by a qualified geologist in accordance with industry-standard rock core logging procedures. A geotechnical investigation report documenting core logging results, rock descriptions, and relevant geotechnical data will be submitted along with the final report.

5.1.1 Borehole Advancement

The boreholes for the bedrock wells will be advanced using a double-casing rotary-vibratory (sonic) drilling rig that can advance through overburden soil/fill and bedrock. The sonic tooling will consist of an 8-inch core barrel with a 10-inch override casing to provide a continuous core across the entire length of the borehole. Continuous soil sampling will be performed using 2-foot split-spoons or shelby tubes. The soils will be screened with photoionization detector (PID) and logged in the field by a YU field engineer, and one soil sample will be collected from the most impacted interval based on (PID) screening and field observations from each boring. The soil sample will be analyzed for TCL VOCs only.

After competent bedrock is identified, the borehole will be advanced 5 feet into the competent bedrock, and an 8-inch diameter steel outer casing will be grouted in place to keep the borehole open and to prevent vertical migration of overburden groundwater or contamination into deeper intervals. The 10-inch override casing will remain in place during drilling to isolate the borehole from surrounding materials until the annular seal is installed and the grout has fully set. The grout will be allowed to set for at least one day before resuming drilling. The grout and bedrock will then be cored to a depth of 16 ft into the bedrock. During bedrock coring, field personnel will screen the work area using a photoionization detector (PID) and will record any notable PID readings or evidence of contamination. Water levels at this borehole will be monitored continuously during coring, and any sudden changes in water elevation will be documented with the corresponding drilling depth and time of observation. These observations will be recorded on the borehole logs and included in the final summary report.

To mitigate the risk of vertically spreading contamination during drilling and well installation, casing will be continuously advanced using the override system and grouted in place prior to coring into competent bedrock. The drilling fluids (if used) will be contained and properly managed, and all equipment will be decontaminated between boreholes to avoid cross-contamination.

A contingency protocol will be implemented in the event that drilling encounters an unforeseen vertical preferential pathway or high contaminant zone. In such circumstances, drilling will be

halted and the zone will be sealed using bentonite or slurry grout before continuing. If conditions warrant, the entire borehole may be abandoned and re-drilled at an alternate location.

5.1.2 Bedrock Geophysical Survey

Following the completion of borehole advancement and prior to well installation, a downhole geophysical survey will be conducted in each of the five bedrock boreholes to characterize the physical and structural properties of the underlying bedrock and evaluate groundwater flow behavior. The primary purpose of the geophysical survey is to identify the presence, orientation, and relative aperture of fractures; detect preferential groundwater flow pathways; and assess the potential for vertical or lateral contaminant migration within the bedrock regime. These information will also be used to determine the feasibility of potential future groundwater treatment.

The geophysical work will be performed by NOVA Geophysical Services, and a detailed scope of work and the qualifications of the personnel have been prepared by NOVA and is included in *Appendix F* of this work plan. The NOVA geophysical plan outlines the equipment, methods, data processing techniques, and interpretive approach that will be used during the investigation. As described in the appendix, the following geophysical logs will be collected, at a minimum: temperature, single-point resistivity, spontaneous potential, fluid conductivity, natural gamma, caliper, optical televiewer, acoustic televiewer, and vertical flowmeter measurements under both ambient and stressed conditions. The plan also includes descriptions of how each log type contributes to the hydrogeologic interpretation, the limitations of each method, and the software that will be used to digitize and process the collected data. Final deliverables will include visual data outputs such as rose diagrams, stereonets, and other fracture orientation plots.

A vertical flowmeter capable of detecting both upward and downward borehole flow will be used to characterize vertical gradients and assess the connectivity of water-bearing fractures. The measurement range and sensitivity of the selected tool are provided in the NOVA geophysical plan. Additionally, static water levels will be measured in nearby existing wells and in newly installed bedrock wells both prior to and during any flowmeter testing activities. All water level data and geophysical survey findings will be summarized in the final report.

5.1.3 Bedrock Monitoring Well Installation

After the completion of the bedrock geophysical survey, the bedrock groundwater monitoring wells will be installed in the borehole using 10 feet of 4-inch diameter, 0.02-slot PVC well screen starting from 6 ft to 16 ft below the competent bedrock and completed using 4-inch PVC well riser to the ground surface. The annular space will be filled with filter sand extending 1 foot above the well screen, followed by 2 feet of bentonite above the filter sand and a cement-bentonite grout to ground surface. Each well will be finished at grade with a locking well cap and flush mount cover. If NAPL is encountered in the bedrock, the monitoring well will be converted to recovery wells as depicted in section 5.0.

5.1.4 Bedrock and Existing Monitoring Wells Development

Following installation, each bedrock groundwater monitoring well and existing on-site monitoring wells will be developed to achieve hydraulic connection between the formation and the well screen. A submersible pump or a peristaltic pump will be used for development at each well.

During development, the field supervisor will record development information on the Well Sampling and Purging form, provided in *Appendix G*. Periodic readings (every five to ten minutes) will include depth to water, pumping rate, temperature, pH, conductivity and turbidity. The wells will be developed using a surge and pump method such that the pH and conductivity of the groundwater stabilize and the turbidity reading of 5 nephelometric turbidity units (NTU) or less, or until at least three well volumes have been purged from the well. Development water will be containerized and managed as investigation-derived waste (IDW) in accordance with applicable state and federal regulations. In addition, water levels will be recorded in adjacent wells during development activities to monitor for potential drawdown and assess connectivity.

5.1.5 Bedrock and Existing Monitoring Wells Survey

All newly installed bedrock monitoring wells and existing on-site monitoring wells will be surveyed by a New York State-licensed land surveyor. The survey will include horizontal location coordinates (X, Y) and the vertical elevations (Z) of the following reference points: the top of the well casing (TOC), ground surface at the well location, and the protective well cover (if applicable). Survey data will be collected in accordance with NYSDEC guidance and referenced to the North American Datum of 1983 (NAD83) for horizontal control and the North American Vertical Datum of 1988 (NAVD88) for vertical control. All groundwater water level measurements will be made to the near 0.01 feet.

5.2 GROUNDWATER SAMPLING AND ANALYSIS

5.2.1 Well Gauging

In accordance with EPA low-flow sampling protocols, the bedrock monitoring wells and the existing wells will be sampled a minimum of one week following their development. Immediately prior to the groundwater sampling, the depth to water in each monitoring well will be gauged by an interface probe and to measure any separate phase liquid that is detected. The gauging results will be recorded in the field notebook and on the Well Monitoring and Gauging form, provided in *Appendix G*.

5.2.2 Groundwater Sampling

The bedrock monitoring wells and the existing wells will be purged and sampled in accordance with EPA's low-flow sampling procedures using a submersible or peristaltic pump. The purge water will be monitored for turbidity and water quality indicators [i.e., pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), temperature, and specific conductivity] with measurements collected approximately every five minutes. Stabilization will be considered achieved when three consecutive readings meet the following low-flow sampling criteria: ±0.1 pH units, ±0.2°C temperature, ±3% specific conductivity, ±10% for DO, and ±10 mV for ORP. Turbidity will also be monitored and must be less than 5 NTU prior to sampling. Purged water will be places in 55-gallon drums. The drums will be disposed at a permitted facility after receiving sample results. Groundwater samples will be collected in laboratory supplied pre-cleaned sampling containers, placed in storage/transportation coolers, preserved with ice, and shipped under proper chain of custody procedures to a certified laboratory.

5.2.3 Analysis of Groundwater Samples

All groundwater samples will be collected and analyzed for TCL VOCs by EPA Method 8260C, Semi-volatile Organic Compound (SVOCs) by EPA Method 8270D, pesticides by EPA Method 8081B, polychlorinated biphenyls (PCBs) by EPA Method 8082A, total metals analysis, including hexavalent and trivalent chromium, will be performed using EPA Method 6010D, and mercury will be analyzed using EPA Method 7473. In addition, samples will be analyzed for per- and polyfluoroalkyl substances (PFAS) using EPA Method 537.1 or EPA Draft Method 1633, cyanide using EPA Method 9012B, and 1,4-dioxane using EPA Method 8270D with selective ion monitoring (SIM) or EPA Method 522, as appropriate. The sample quantities, analytical methods, and QA/QC samples required are summarized in *Table 1 — Groundwater Sampling Program Summary*. Each sample container will be properly preserved, labeled, and placed in an ice-filled cooler for delivery via courier under standard COC procedures to a NYSDOH ELAP-certified laboratory for analysis with Category B deliverables.

5.3 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) AND DATA USABILITY REVIEW

5.3.1 Analytical methods

All samples collected during this site investigation will be analyzed using NYSDEC or EPA-approved analytical methods that comply with the most recent edition of the EPA's "Test Methods for Evaluating Solid Waste" (SW-846), "Methods for Water and Wastewater" (prepared and published by the American Public Health Association, American Waterworks Association and Water Pollution Control Federation), or other agency-approved methods.

5.3.2 Laboratory

All samples will be analyzed by a certified laboratory which pursuant to the NYSDOH Environmental Laboratory Accreditation Program (ELAP) for the category of parameters. The sample analytical methods will compliance with the most current DEC Analytical Services Protocol (ASP).

5.3.3 Data Submittal

All analytical data will be submitted in complete ASP Category B deliverables. Field duplicates, and matrix spikes, matrix spike duplicates will be collected at a rate of 5% of total samples and will be used for data quality assurance. Trip blanks will be used each trip that aqueous volatile organic samples are shipped. Field blanks will be collected one (1) per week. The laboratory's in-house QA/QC detection limits will be utilized more stringent than applicable EPA methods.

5.3.4 Data Usability Summary Report

The accuracy and the precision of the analytical results will be evaluated by a qualified, independent, data validation specialist. A Data Usability Summary Report (DUSR) will be prepared in the compliance of the NYSDEC ASP. The DUSR will include the determination of whether the data meets the project-specific criteria for quality and data use. The DUSR validation will be completed in accordance with NYSDEC's DER-10.

6.0 CONTIGENCY PLAN

If NAPL detected in the bedrock groundwater aquifer, the bedrock monitoring wells will be converted to NAPL recovery wells. Recovery wells are designed to accommodate the uncertainty of long-term NAPL recovery rates. Each well will be equipped with a 5-foot long, 4-inch diameter, schedule 40 PVC sump to collect NAPL. Routine NAPL monitor and removal will be performed by interface probe and submersible pumps. The monitoring schedule may be adjusted on an as-needed basis (i.e., conducted more frequently or less frequently) depending on the data collected during the routine monitoring. The recovered NAPL will be containerized in NYSDOT-approved 55-gallon drums that are labeled and disposed of off-site as hazardous material.

7.0 PROJECT MANAGEMENT

Project management for this Supplemental Remedial Investigation (SRI) will be conducted under a structured program that ensures the safety of personnel, protection of the community, and integrity of collected data. The program includes site-specific health and safety procedures, quality assurance measures, and environmental monitoring requirements designed for all phases of the SRI fieldwork. A list of contact information for relevant personnel associated with the site is include in *Table 3*.

All site activities will be performed in accordance with the Health and Safety Plan (HASP) prepared by YU & Associates, included as *Appendix D*. The HASP establishes protocols for worker protection during intrusive investigation activities and outlines procedures to address potential exposure to contamination or physical hazards at the Site.

A site-specific Community Air Monitoring Plan (CAMP) is as *Appendix E*. The CAMP provides for continuous real-time monitoring of particulates (PM-10) and volatile organic compounds (VOCs) at both the upwind and downwind perimeters of the work area during all ground-intrusive activities. The CAMP also includes special requirements for work conducted within 20 feet of sensitive receptors, such as occupied buildings or businesses. In such cases, enhanced dust and VOC control measures, increased monitoring frequency, and lower action thresholds will be implemented to minimize exposure risk.

The Quality Assurance Project Plan (QAPP), included in *Appendix C*, governs data collection, handling, and validation to ensure that environmental data generated during the investigation are scientifically reliable, reproducible, and defensible. The QAPP includes procedures for sample collection, preservation, chain-of-custody, and laboratory analysis.

In addition to the above plans, a Field Sampling Plan (FSP), included in *Appendix B* has been developed and incorporated into this SRIWP to guide the scope and methodology for all sampling events, including soil, groundwater, and rock core sampling. The FSP details the sampling locations, equipment, techniques, and quality control procedures to be followed.

All project team members, subcontractors, and vendors will be required to adhere to these plans and protocols throughout the duration of fieldwork to ensure compliance with NYSDEC and NYSDOH requirements and to maintain a safe and controlled work environment.

8.0 REPORTING

Daily progress reports will be submitted to the NYSDEC and NYSDOH following each workday during implementation of the SRWI field activities to summarize work progress, field findings, and air monitoring results. On days when borehole geophysical survey work is performed, preliminary (raw) geophysical data collected that day will be submitted to NYSDEC as soon as it becomes available. When feasible, these data will be submitted within 24 hours of collection, alongside the daily report. Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers within one week following the end of the month of the reporting period and will include a quantitative presentation of work performed at the Site during the previous reporting period, description of any changes of work scope and/or schedule, and/or sample analytical results summary. The results of SRI and DUSR will be presented in the revised RAWP including the following:

- Description of field activities and methodologies.
- Summary of the analytical results with a comparison to appropriate regulations.
- Figures illustrating approximate sample locations on scaled drawings.
- Photographic documentation.
- Data tables summarizing the data collected during the investigation.
- Conclusions and recommendations.

9.0 SCHEDULE

The field work associated with the scope outlined in this SRIWP will be mobilized within four weeks of obtaining NYSDEC approval of this work plan. The duration of this scope is anticipated to be approximately two weeks and will be conducted with one mobilization. The detail of project schedule is provided in *Table 2 – Project Schedule*.

10.0 REFERENCE

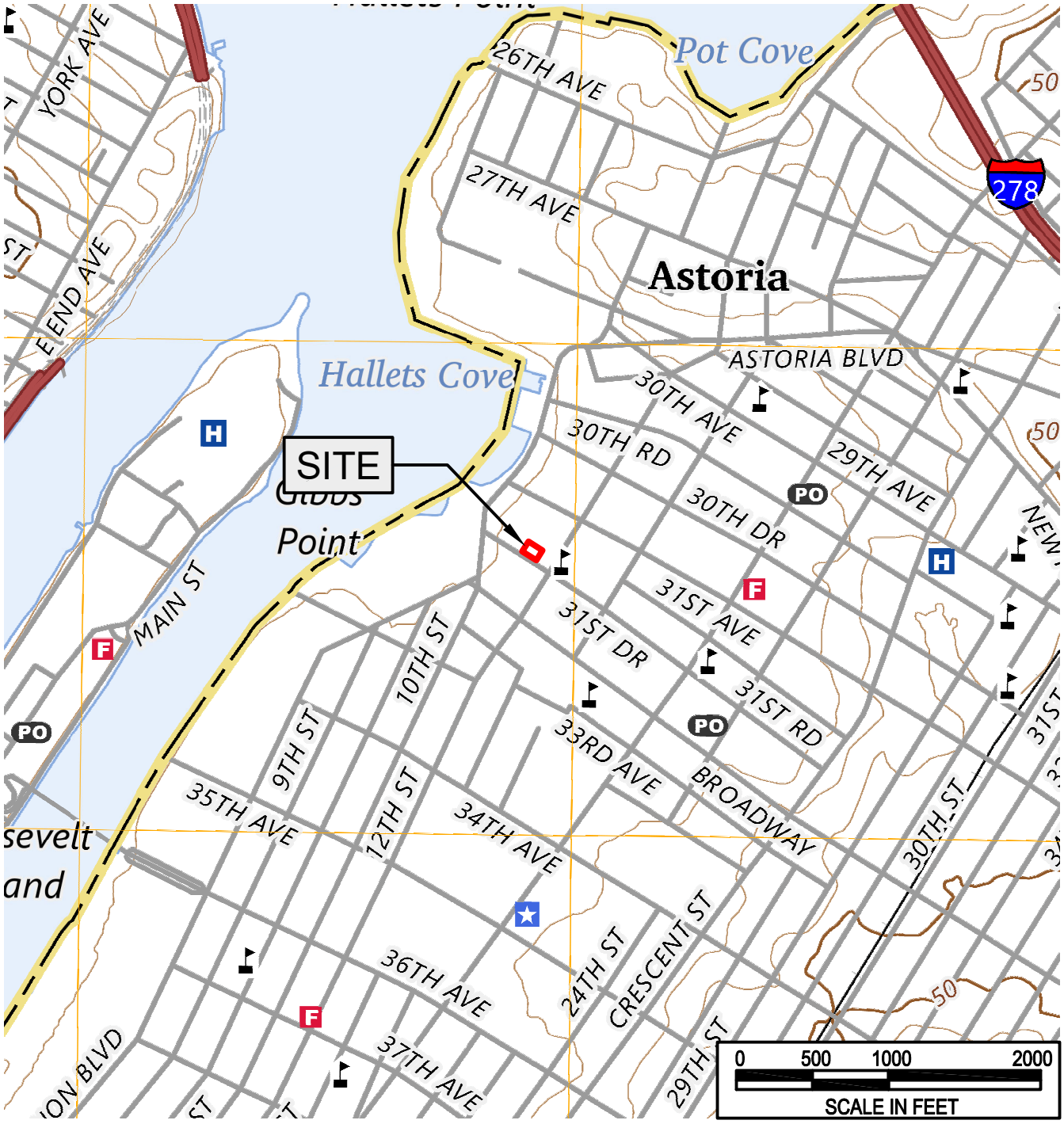
1. New York State Department of Environmental Conservation, (2010). DER-10 Technical Guidance for Site Investigation and Remediation. Division of Environmental Remediation, May 2010.

2. New York State Department of Environmental Conservation, (2006). 6 NYCRR Part 375 Environmental Remediation Programs. Division of Environmental Remediation, December, 2006.

3. New York State Department of Environmental Conservation, (as revised June 1998) Division of Water Technical and Operational Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values and Effluent Limitations.

4. Impact Environmental Closures, Remedial Investigation Report (July 2020), 11-35 31st Drive, Astoria, New York, Impact Environmental Closures project number 11845-01

FIGURES



Map Reference: USGS Central Park Quadrangle 7.5-Minute Series NY - NJ 2023

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering

611 River Drive - 3rd Floor
Elmwood Park, NJ 07407

Tel: (201) 791-0075
Fax: (201) 791-4533

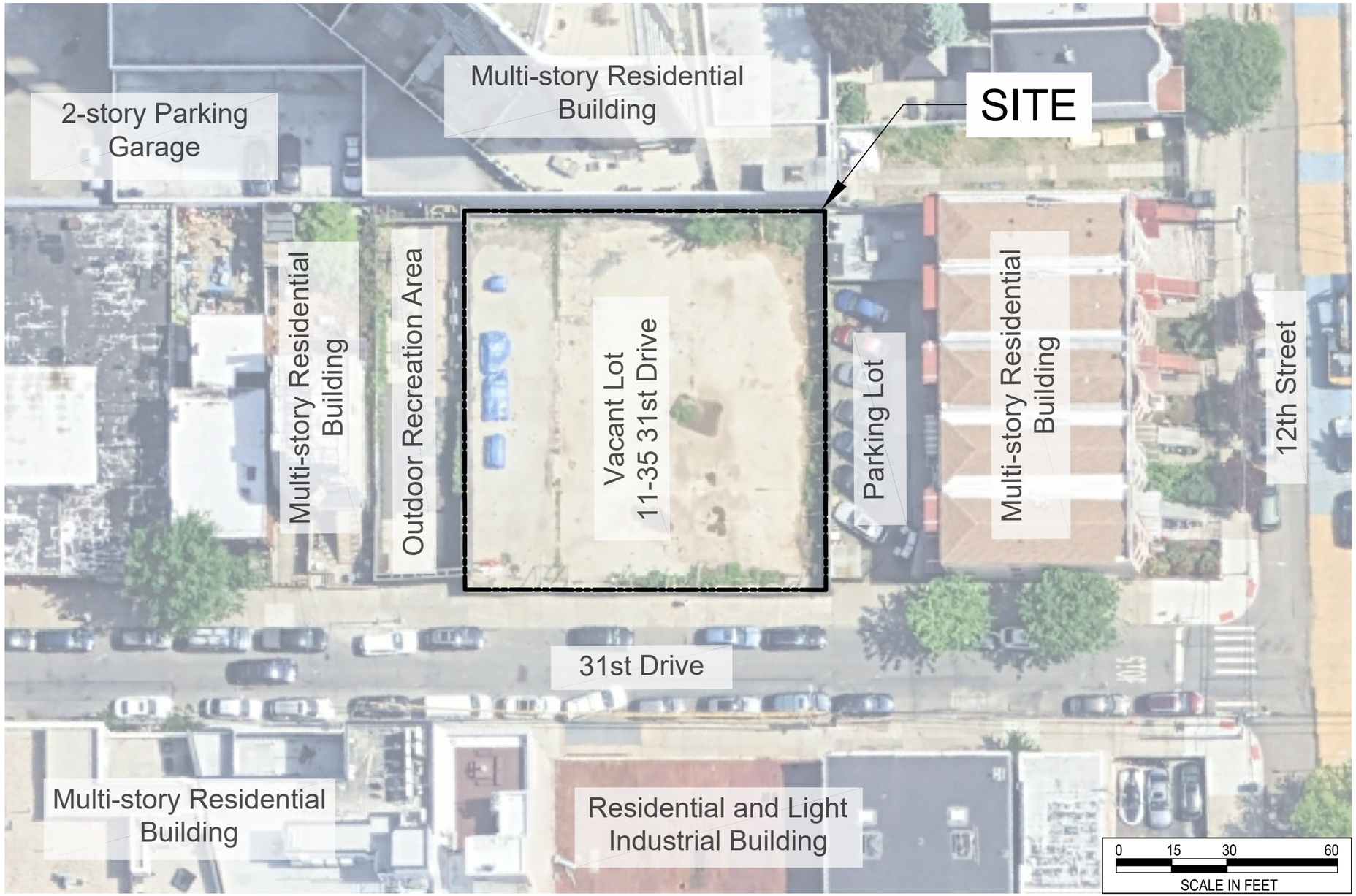
SITE LOCATION MAP
11-35 31st Drive

ASTORIA

QUEEN NEW YORK

JOB NO.: 23094	SCALE: As Shown	DATE: 7/17/2025	FIG. 1

P:\23123094 (11-35 31st Drive)\Supplemental Investigation\Work Plan\DWG\ 11-35 31st Drive Figures.dwg Jul 17, 2025 - 11:03am zyang



LEGEND:

Site Boundary

Base Map Reference: Google Earth Pro, 2023

YU & Associates
Geotechnical, Environmental and Civil Engineering

611 River Drive - 3rd Floor
Elmwood Park, NJ 07407

Tel: (201) 791-0075
Fax: (201) 791-4533

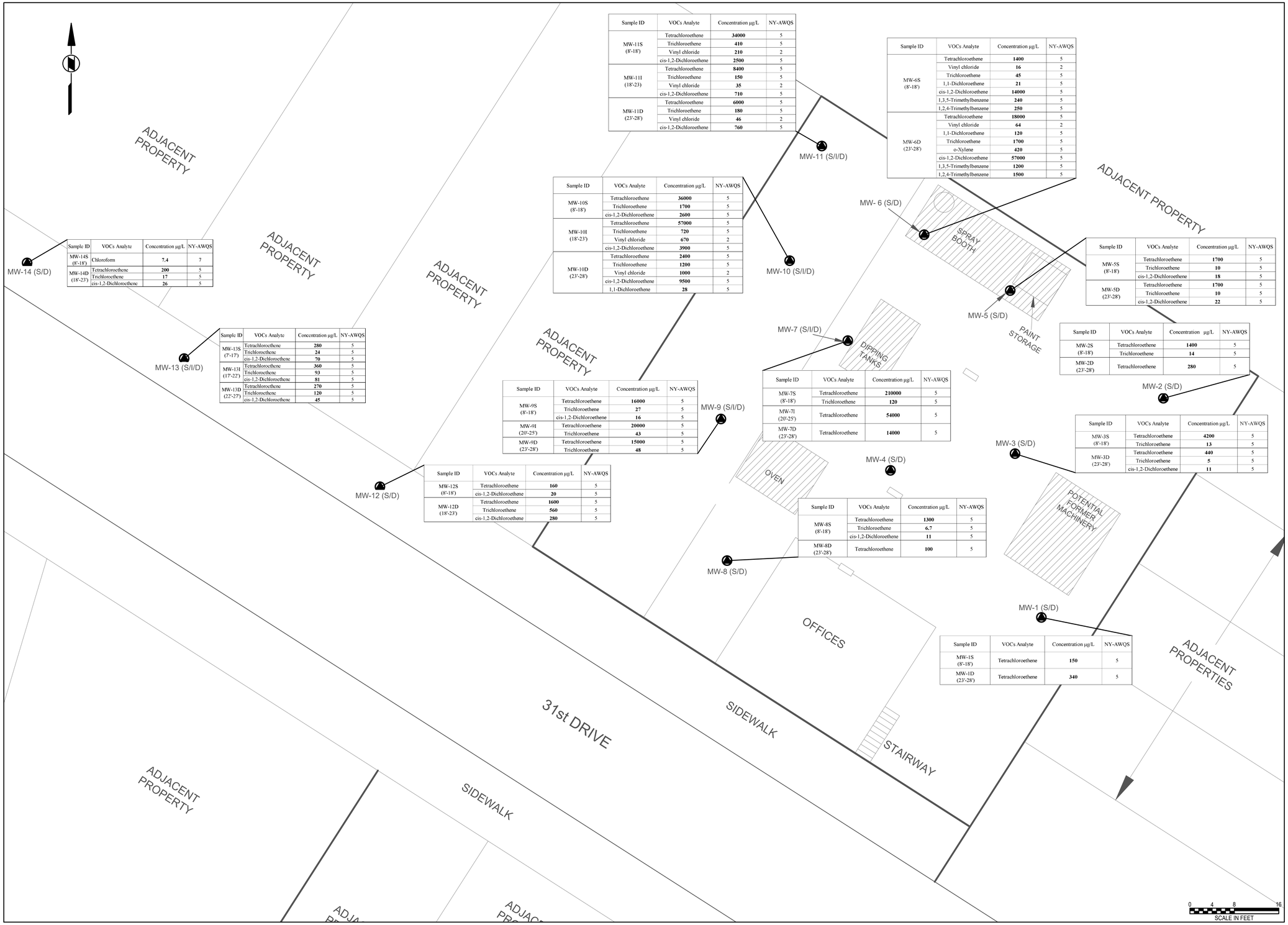
SITE PLAN

11-35 31st Street

Astoria

QUEENS NEW YORK

JOB NO.: 23094	SCALE: As Shown	DATE: 08/05/2025	FIG. 2



Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-14S (8'-18')	Chloroform	**7.4**	7
MW-14D (18'-23')	Tetrachloroethene	**200**	5
	Trichloroethene	**17**	5
	cis-1,2-Dichloroethene	**26**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-13S (7-17)	Tetrachloroethene	**280**	5
	Trichloroethene	**24**	5
	cis-1,2-Dichloroethene	**70**	5
MW-13I (17'-22')	Tetrachloroethene	**360**	5
	Trichloroethene	**93**	5
	cis-1,2-Dichloroethene	**81**	5
MW-13D (22'-27')	Tetrachloroethene	**270**	5
	Trichloroethene	**120**	5
	cis-1,2-Dichloroethene	**45**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-12S (8'-18')	Tetrachloroethene	**160**	5
	cis-1,2-Dichloroethene	**20**	5
MW-12D (18'-23')	Tetrachloroethene	**1600**	5
	Trichloroethene	**560**	5
	cis-1,2-Dichloroethene	**280**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-11S (8'-18')	Tetrachloroethene	**34000**	5
	Trichloroethene	**410**	5
	Vinyl chloride	**210**	2
	cis-1,2-Dichloroethene	**2500**	5
MW-11I (18'-23)	Tetrachloroethene	**8400**	5
	Trichloroethene	**150**	5
	Vinyl chloride	**35**	2
	cis-1,2-Dichloroethene	**710**	5
MW-11D (23'-28')	Tetrachloroethene	**6000**	5
	Trichloroethene	**180**	5
	Vinyl chloride	**46**	2
	cis-1,2-Dichloroethene	**760**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-10S (8'-18')	Tetrachloroethene	**36000**	5
	Trichloroethene	**1700**	5
	cis-1,2-Dichloroethene	**2600**	5
MW-10I (18'-23')	Tetrachloroethene	**57000**	5
	Trichloroethene	**720**	5
	Vinyl chloride	**670**	2
	cis-1,2-Dichloroethene	**3900**	5
MW-10D (23'-28')	Tetrachloroethene	**2400**	5
	Trichloroethene	**1200**	5
	Vinyl chloride	**1000**	2
	cis-1,2-Dichloroethene	**9500**	5
	1,1-Dichloroethene	**28**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-9S (8'-18')	Tetrachloroethene	**16000**	5
	Trichloroethene	**27**	5
	cis-1,2-Dichloroethene	**16**	5
MW-9I (20'-25')	Tetrachloroethene	**20000**	5
	Trichloroethene	**43**	5
MW-9D (23'-28')	Tetrachloroethene	**15000**	5
	Trichloroethene	**48**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-8S (8'-18')	Tetrachloroethene	**1300**	5
	Trichloroethene	**6.7**	5
	cis-1,2-Dichloroethene	**11**	5
MW-8D (23'-28')	Tetrachloroethene	**100**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-7S (8'-18')	Tetrachloroethene	**210000**	5
	Trichloroethene	**120**	5
MW-7I (20'-25')	Tetrachloroethene	**54000**	5
MW-7D (23'-28')	Tetrachloroethene	**14000**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-6S (8'-18')	Tetrachloroethene	**1400**	5
	Vinyl chloride	**16**	2
	Trichloroethene	**45**	5
	1,1-Dichloroethene	**21**	5
	cis-1,2-Dichloroethene	**14000**	5
	1,3,5-Trimethylbenzene	**240**	5
	1,2,4-Trimethylbenzene	**250**	5
MW-6D (23'-28')	Tetrachloroethene	**18000**	5
	Vinyl chloride	**64**	2
	1,1-Dichloroethene	**120**	5
	Trichloroethene	**1700**	5
	o-Xylene	**420**	5
	cis-1,2-Dichloroethene	**57000**	5
	1,3,5-Trimethylbenzene	**1200**	5
	1,2,4-Trimethylbenzene	**1500**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-5S (8'-18')	Tetrachloroethene	**1700**	5
	Trichloroethene	**10**	5
	cis-1,2-Dichloroethene	**18**	5
MW-5D (23'-28')	Tetrachloroethene	**1700**	5
	Trichloroethene	**10**	5
	cis-1,2-Dichloroethene	**22**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-2S (8'-18')	Tetrachloroethene	**1400**	5
	Trichloroethene	**14**	5
MW-2D (23'-28')	Tetrachloroethene	**280**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-3S (8'-18')	Tetrachloroethene	**4200**	5
	Trichloroethene	**13**	5
MW-3D (23'-28')	Tetrachloroethene	**440**	5
	Trichloroethene	**5**	5
	cis-1,2-Dichloroethene	**11**	5

Sample ID	VOCs Analyte	Concentration µg/L	NY-AWQS
MW-1S (8'-18')	Tetrachloroethene	**150**	5
MW-1D (23'-28')	Tetrachloroethene	**340**	5

LEGEND:

SOIL BORING LOCATIONS

NY-AWQS NEW YORK TECHNICAL AND OPERATIONAL GUIDANCE SERIES 111 AMBIENT WATER QUALITY STANDARDS

NOTES

1. THE BASE MAP IS EXTRACTED FROM THE REMEDIAL INVESTIGATION REPORT BY THE IMPACT ENVIRONMENTAL CLOSURES, INC., DATED JULY, 2020.
2. THE VALUES IN BOLD REPRESENT THE GROUNDWATER SAMPLE VOC EXCEEDING AMBIENT WATER QUALITY STANDARDS.
3. GROUNDWATER INVESTIGATION RESULTS ARE OBTAINED FROM THE JULY 2020 REMEDIAL INVESTIGATION REPORT.

No.	Date	Revision

REVISIONS

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering
611 River Drive - 3rd Floor
Elmwood Park, NJ 07407
Tel: (201) 791-0075
Fax: (201) 791-4533

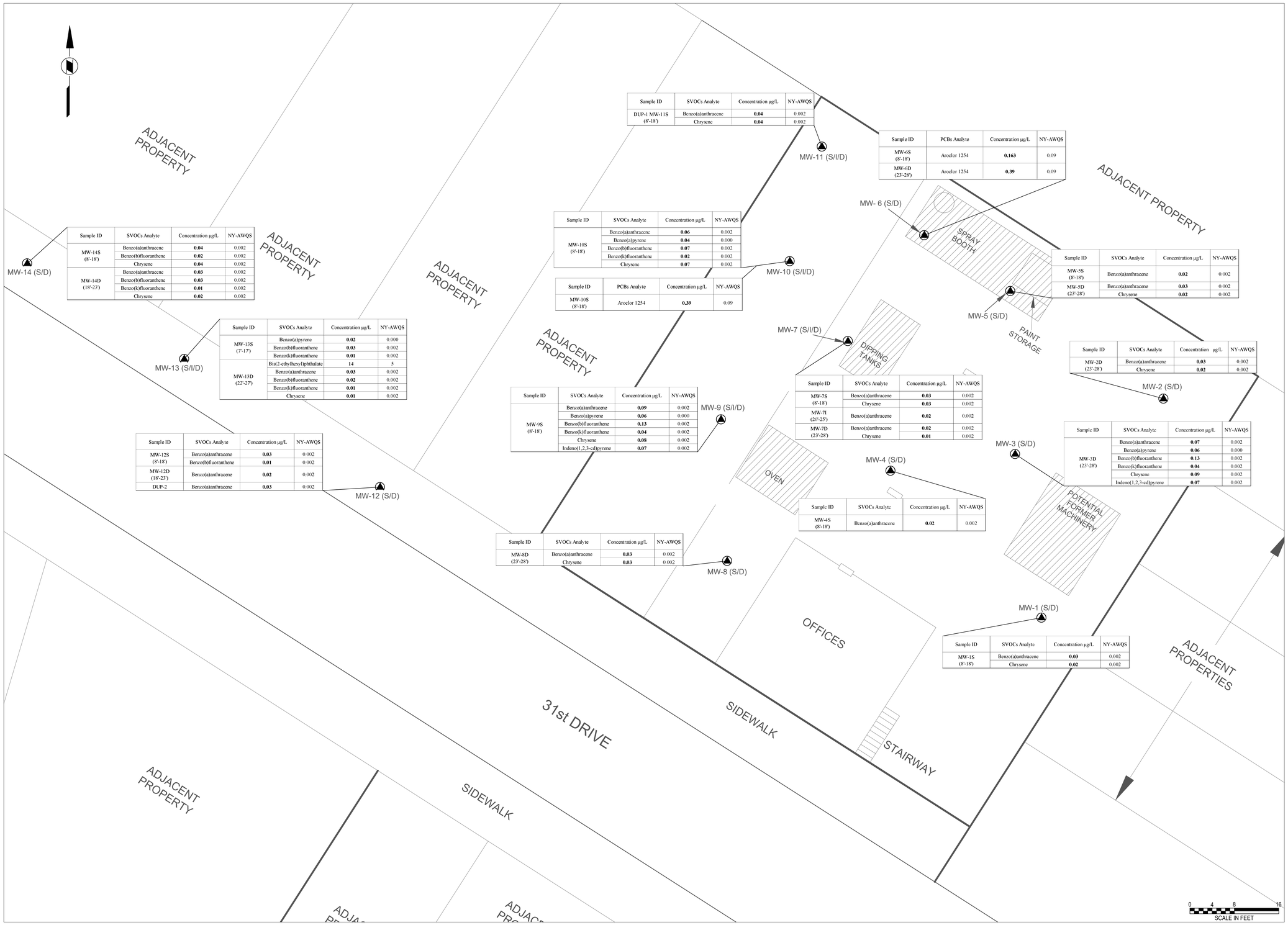
PROJECT:

11-35 31ST DRIVE, ASTORIA, NEW YORK

TITLE: REMEDIAL INVESTIGATION GROUNDWATER SAMPLE VOCS EXCEEDANCE MAP

JOB NO: 23094	FIGURE NO: 3
DATE: 08/04/2025	
SCALE: AS SHOWN	
DRAWN BY: ZY	
CHECKED BY:	SHEET 1 OF 1

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Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-14S (8'-18')	Benzo(a)anthracene	**0.04**	0.002
	Benzo(b)fluoranthene	**0.02**	0.002
	Chrysene	**0.04**	0.002
MW-14D (18'-23')	Benzo(a)anthracene	**0.03**	0.002
	Benzo(b)fluoranthene	**0.03**	0.002
	Benzo(k)fluoranthene	**0.01**	0.002
	Chrysene	**0.02**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-13S (7'-17')	Benzo(a)pyrene	**0.02**	0.000
	Benzo(b)fluoranthene	**0.03**	0.002
	Benzo(k)fluoranthene	**0.01**	0.002
MW-13D (22'-27')	Bis(2-ethylhexyl)phthalate	**14**	5
	Benzo(a)anthracene	**0.03**	0.002
	Benzo(b)fluoranthene	**0.02**	0.002
	Benzo(k)fluoranthene	**0.01**	0.002
	Chrysene	**0.01**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-12S (8'-18')	Benzo(a)anthracene	**0.03**	0.002
	Benzo(b)fluoranthene	**0.01**	0.002
MW-12D (18'-23')	Benzo(a)anthracene	**0.02**	0.002
DUP-2	Benzo(a)anthracene	**0.03**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
DUP-1 MW-11S (8'-18')	Benzo(a)anthracene	**0.04**	0.002
	Chrysene	**0.04**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-10S (8'-18')	Benzo(a)anthracene	**0.06**	0.002
	Benzo(a)pyrene	**0.04**	0.000
	Benzo(b)fluoranthene	**0.07**	0.002
	Benzo(k)fluoranthene	**0.02**	0.002
	Chrysene	**0.07**	0.002

Sample ID	PCBs Analyte	Concentration µg/L	NY-AWQS
MW-10S (8'-18')	Aroclor 1254	**0.39**	0.09

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-9S (8'-18')	Benzo(a)anthracene	**0.09**	0.002
	Benzo(a)pyrene	**0.06**	0.000
	Benzo(b)fluoranthene	**0.13**	0.002
	Benzo(k)fluoranthene	**0.04**	0.002
	Chrysene	**0.08**	0.002
	Indeno(1,2,3-cd)pyrene	**0.07**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-8D (23'-28')	Benzo(a)anthracene	**0.03**	0.002
	Chrysene	**0.03**	0.002

Sample ID	PCBs Analyte	Concentration µg/L	NY-AWQS
MW-6S (8'-18')	Aroclor 1254	**0.163**	0.09
MW-6D (23'-28')	Aroclor 1254	**0.39**	0.09

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-5S (8'-18')	Benzo(a)anthracene	**0.02**	0.002
MW-5D (23'-28')	Benzo(a)anthracene	**0.03**	0.002
	Chrysene	**0.02**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-7S (8'-18')	Benzo(a)anthracene	**0.03**	0.002
	Chrysene	**0.03**	0.002
MW-7I (20'-25')	Benzo(a)anthracene	**0.02**	0.002
MW-7D (23'-28')	Benzo(a)anthracene	**0.02**	0.002
	Chrysene	**0.01**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-4S (8'-18')	Benzo(a)anthracene	**0.02**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-2D (23'-28')	Benzo(a)anthracene	**0.03**	0.002
	Chrysene	**0.02**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-3D (23'-28')	Benzo(a)anthracene	**0.07**	0.002
	Benzo(a)pyrene	**0.06**	0.000
	Benzo(b)fluoranthene	**0.13**	0.002
	Benzo(k)fluoranthene	**0.04**	0.002
	Chrysene	**0.09**	0.002
	Indeno(1,2,3-cd)pyrene	**0.07**	0.002

Sample ID	SVOCs Analyte	Concentration µg/L	NY-AWQS
MW-1S (8'-18')	Benzo(a)anthracene	**0.03**	0.002
	Chrysene	**0.02**	0.002

LEGEND:

SOIL BORING LOCATIONS

NY-AWQS NEW YORK TECHNICAL AND OPERATIONAL GUIDANCE SERIES 111 AMBIENT WATER QUALITY STANDARDS

NOTES

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No.	Date	Revision

REVISIONS

YU & Associates Engineers, P.C.
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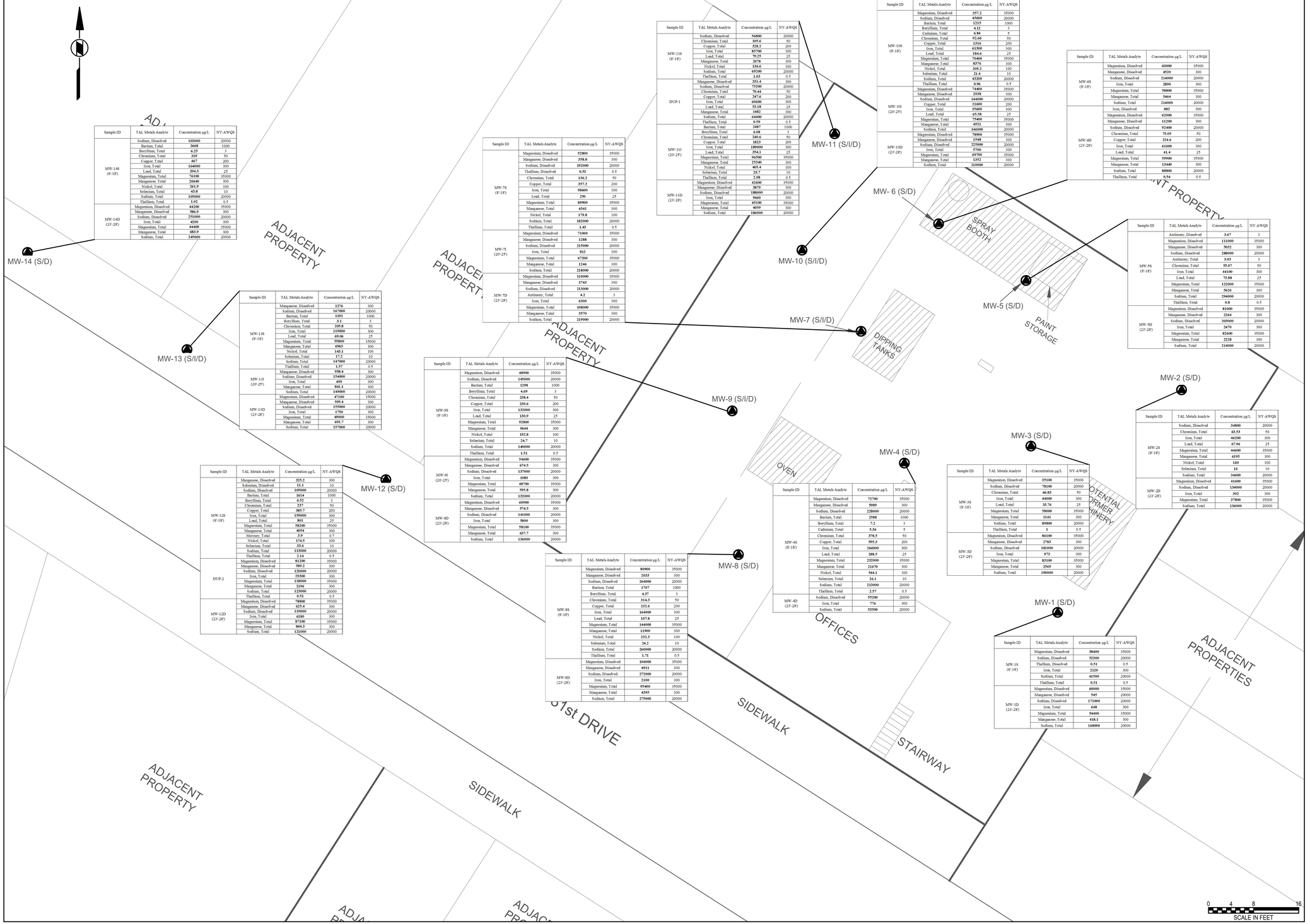
PROJECT:

11-35 31ST DRIVE, ASTORIA, NEW YORK

TITLE: REMEDIAL INVESTIGATION GROUNDWATER SAMPLE SVOCS, PESTICIDES & PCBS EXCEEDANCE MAP

JOB NO: 23094	FIGURE NO: 4
DATE: 08/04/2025	
SCALE: AS SHOWN	
DRAWN BY: ZY	
CHECKED BY:	SHEET 1 OF 1

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Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-14S (8'-18')	Sodium, Dissolved	**103000**	20000
	Barium, Total	**2668**	1000
	Beryllium, Total	**6.25**	3
	Chromium, Total	**205**	50
	Copper, Total	**467**	200
	Iron, Total	**164000**	300
	Lead, Total	**204.3**	25
	Magnesium, Total	**76100**	35000
	Manganese, Total	**20640**	300
	Nickel, Total	**261.9**	100
	Selenium, Total	**43.8**	10
	Sodium, Total	**105000**	20000
	Thallium, Total	**1.02**	0.5
MW-14D (23'-28')	Magnesium, Dissolved	**44200**	35000
	Manganese, Dissolved	**586.9**	300
	Sodium, Dissolved	**251000**	20000
	Iron, Total	**4200**	300
	Magnesium, Total	**44400**	35000
	Manganese, Total	**683.9**	300
	Sodium, Total	**245000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-13S (8'-18')	Manganese, Dissolved	**1276**	300
	Sodium, Dissolved	**167000**	20000
	Barium, Total	**1191**	1000
	Beryllium, Total	**3.1**	3
	Chromium, Total	**205.8**	50
	Iron, Total	**119000**	300
	Lead, Total	**69.06**	25
	Magnesium, Total	**58800**	35000
	Manganese, Total	**4963**	300
	Nickel, Total	**143.1**	100
	Selenium, Total	**17.2**	10
	Sodium, Total	**147000**	20000
	Thallium, Total	**1.57**	0.5
MW-13I (20'-25')	Manganese, Dissolved	**958.4**	300
	Sodium, Dissolved	**154000**	20000
	Iron, Total	**459**	300
	Manganese, Total	**841.1**	300
	Sodium, Total	**149000**	20000
MW-13D (23'-28')	Magnesium, Dissolved	**47100**	35000
	Manganese, Dissolved	**595.4**	300
	Sodium, Dissolved	**155000**	20000
	Iron, Total	**1750**	300
	Magnesium, Total	**49000**	35000
	Manganese, Total	**691.7**	300
	Sodium, Total	**157000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-11S (8'-18')	Sodium, Dissolved	**56800**	20000
	Chromium, Total	**105.6**	50
	Copper, Total	**328.2**	200
	Iron, Total	**85700**	300
	Lead, Total	**79.25**	25
	Manganese, Total	**2078**	300
	Nickel, Total	**136.6**	100
	Sodium, Total	**69200**	20000
	Thallium, Total	**1.03**	0.5
DUP-1	Manganese, Dissolved	**331.4**	300
	Sodium, Dissolved	**75200**	20000
	Chromium, Total	**70.44**	50
	Copper, Total	**247.6**	200
	Iron, Total	**60600**	300
	Lead, Total	**53.18**	25
	Manganese, Total	**1482**	300
	Sodium, Total	**64400**	20000
	Thallium, Total	**0.59**	0.5
MW-11I (20'-25')	Barium, Total	**2497**	1000
	Beryllium, Total	**6.08**	3
	Chromium, Total	**240.6**	50
	Copper, Total	**1823**	200
	Iron, Total	**189000**	300
	Lead, Total	**354.1**	25
	Magnesium, Total	**96500**	35000
	Manganese, Total	**2534***0*	300
	Nickel, Total	**405.4**	100
	Selenium, Total	**20.7**	10
	Thallium, Total	**2.08**	0.5
MW-11D (23'-28')	Magnesium, Dissolved	**42600**	35000
	Manganese, Dissolved	**3879**	300
	Sodium, Dissolved	**188000**	20000
	Iron, Total	**9460**	300
	Magnesium, Total	**45100**	35000
	Manganese, Total	**4059**	300
	Sodium, Total	**186000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-10S (8'-18')	Magnesium, Dissolved	**357.2**	35000
	Sodium, Dissolved	**45600**	20000
	Barium, Total	**1215**	1000
	Beryllium, Total	**4.12**	3
	Cadmium, Total	**6.84**	5
	Chromium, Total	**92.66**	50
	Copper, Total	**1316**	200
	Iron, Total	**61300**	300
	Lead, Total	**184.4**	25
	Magnesium, Total	**70400**	35000
	Manganese, Total	**8376**	300
	Nickel, Total	**209.2**	100
	Selenium, Total	**21.4**	10
	Sodium, Total	**43200**	20000
	Thallium, Total	**0.96**	0.5
MW-10I (20'-25')	Magnesium, Dissolved	**74400**	35000
	Manganese, Dissolved	**2938**	300
	Sodium, Dissolved	**144000**	20000
	Copper, Total	**21600**	200
	Iron, Total	**25800**	300
	Lead, Total	**65.58**	25
	Magnesium, Total	**75400**	35000
	Manganese, Total	**6921**	300
	Sodium, Total	**146000**	20000
MW-10D (23'-28')	Magnesium, Dissolved	**78900**	35000
	Manganese, Dissolved	**1548**	300
	Sodium, Dissolved	**225000**	20000
	Iron, Total	**5700**	300
	Magnesium, Total	**69700**	35000
	Manganese, Total	**1352**	300
	Sodium, Total	**210000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-6S (8'-18')	Magnesium, Dissolved	**60000**	35000
	Manganese, Dissolved	**4520**	300
	Sodium, Dissolved	**214000**	20000
	Iron, Total	**2890**	300
	Magnesium, Total	**58800**	35000
	Manganese, Total	**5464**	300
	Sodium, Total	**214000**	20000
MW-6D (23'-28')	Iron, Dissolved	**882**	300
	Magnesium, Dissolved	**62000**	35000
	Manganese, Dissolved	**11200**	300
	Sodium, Dissolved	**92400**	20000
	Chromium, Total	**75.05**	50
	Copper, Total	**224.6**	200
	Iron, Total	**61600**	300
	Lead, Total	**41.4**	25
	Magnesium, Total	**59900**	35000
	Manganese, Total	**13440**	300
	Sodium, Total	**88800**	20000
	Thallium, Total	**0.54**	0.5

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-7S (8'-18')	Magnesium, Dissolved	**52800**	35000
	Manganese, Dissolved	**358.8**	300
	Sodium, Dissolved	**192000**	20000
	Thallium, Dissolved	**0.53**	0.5
	Chromium, Total	**136.2**	50
	Copper, Total	**357.2**	200
	Iron, Total	**98400**	300
	Lead, Total	**250**	25
	Magnesium, Total	**89900**	35000
	Manganese, Total	**4341**	300
	Nickel, Total	**179.8**	100
	Sodium, Total	**182000**	20000
	Thallium, Total	**1.43**	0.5
MW-7I (20'-25')	Magnesium, Dissolved	**71000**	35000
	Manganese, Dissolved	**1288**	300
	Sodium, Dissolved	**215000**	20000
	Iron, Total	**812**	300
	Magnesium, Total	**67200**	35000
	Manganese, Total	**1246**	300
	Sodium, Total	**218000**	20000
MW-7D (23'-28')	Magnesium, Dissolved	**110000**	35000
	Manganese, Dissolved	**3743**	300
	Sodium, Dissolved	**213000**	20000
	Antimony, Total	**4.2**	3
	Iron, Total	**6360**	300
	Magnesium, Total	**108000**	35000
	Manganese, Total	**3570**	300
	Sodium, Total	**210000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-5S (8'-18')	Antimony, Dissolved	**3.67**	3
	Magnesium, Dissolved	**111000**	35000
	Manganese, Dissolved	**5032**	300
	Sodium, Dissolved	**288000**	20000
	Antimony, Total	**3.03**	3
	Chromium, Total	**55.67**	50
	Iron, Total	**44100**	300
	Lead, Total	**73.88**	25
	Magnesium, Total	**122000**	35000
	Manganese, Total	**5626**	300
	Sodium, Total	**294000**	20000
	Thallium, Total	**0.8**	0.5
MW-5D (23'-28')	Magnesium, Dissolved	**81000**	35000
	Manganese, Dissolved	**2264**	300
	Sodium, Dissolved	**205000**	20000
	Iron, Total	**2470**	300
	Magnesium, Total	**82600**	35000
	Manganese, Total	**2228**	300
	Sodium, Total	**214000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-9S (8'-18')	Magnesium, Dissolved	**48900**	35000
	Sodium, Dissolved	**145000**	20000
	Barium, Total	**1298**	1000
	Beryllium, Total	**4.69**	3
	Chromium, Total	**238.4**	50
	Copper, Total	**230.6**	200
	Iron, Total	**132000**	300
	Lead, Total	**130.9**	25
	Magnesium, Total	**92800**	35000
	Manganese, Total	**9644**	300
	Nickel, Total	**192.8**	100
	Selenium, Total	**24.7**	10
	Sodium, Total	**140000**	20000
	Thallium, Total	**1.51**	0.5
MW-9I (20'-25')	Magnesium, Dissolved	**54600**	35000
	Manganese, Dissolved	**674.5**	300
	Sodium, Dissolved	**137000**	20000
	Iron, Total	**1080**	300
	Magnesium, Total	**48700**	35000
	Manganese, Total	**595.8**	300
	Sodium, Total	**132000**	20000
MW-9D (23'-28')	Magnesium, Dissolved	**60900**	35000
	Manganese, Dissolved	**574.5**	300
	Sodium, Dissolved	**141000**	20000
	Iron, Total	**5890**	300
	Magnesium, Total	**58100**	35000
	Manganese, Total	**637.7**	300
	Sodium, Total	**136000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-2S (8'-18')	Sodium, Dissolved	**34800**	20000
	Chromium, Total	**63.53**	50
	Iron, Total	**46200**	300
	Lead, Total	**67.96**	25
	Magnesium, Total	**44600**	35000
	Manganese, Total	**6195**	300
	Nickel, Total	**160**	100
	Selenium, Total	**16**	10
	Sodium, Total	**34600**	20000
MW-2D (23'-28')	Magnesium, Dissolved	**41600**	35000
	Sodium, Dissolved	**136000**	20000
	Iron, Total	**302**	300
	Magnesium, Total	**37800**	35000
	Sodium, Total	**126000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-3S (8'-18')	Magnesium, Dissolved	**35100**	35000
	Sodium, Dissolved	**78100**	20000
	Chromium, Total	**66.83**	50
	Iron, Total	**44000**	300
	Lead, Total	**33.76**	25
	Magnesium, Total	**58000**	35000
	Manganese, Total	**1141**	300
	Sodium, Total	**89800**	20000
	Thallium, Total	**1**	0.5
MW-3D (23'-28')	Magnesium, Dissolved	**86100**	35000
	Manganese, Dissolved	**2783**	300
	Sodium, Dissolved	**181000**	20000
	Iron, Total	**973**	300
	Magnesium, Total	**83100**	35000
	Manganese, Total	**2569**	300
	Sodium, Total	**190000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-4S (8'-18')	Magnesium, Dissolved	**72700**	35000
	Manganese, Dissolved	**5089**	300
	Sodium, Dissolved	**228000**	20000
	Barium, Total	**2588**	1000
	Beryllium, Total	**7.2**	3
	Cadmium, Total	**5.36**	5
	Chromium, Total	**378.5**	50
	Copper, Total	**595.3**	200
	Iron, Total	**264000**	300
	Lead, Total	**288.5**	25
	Magnesium, Total	**232000**	35000
	Manganese, Total	**21670**	300
	Nickel, Total	**544.1**	100
	Selenium, Total	**26.1**	10
	Sodium, Total	**213000**	20000
	Thallium, Total	**2.57**	0.5
MW-4D (23'-28')	Sodium, Dissolved	**55200**	20000
	Iron, Total	**776**	300
	Sodium, Total	**53500**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-8S (8'-18')	Magnesium, Dissolved	**80900**	35000
	Manganese, Dissolved	**2033**	300
	Sodium, Dissolved	**264000**	20000
	Barium, Total	**1707**	1000
	Beryllium, Total	**4.37**	3
	Chromium, Total	**314.3**	50
	Copper, Total	**232.6**	200
	Iron, Total	**164000**	300
	Lead, Total	**107.8**	25
	Magnesium, Total	**144000**	35000
	Manganese, Total	**11900**	300
	Nickel, Total	**232.3**	100
	Selenium, Total	**24.2**	10
	Sodium, Total	**260000**	20000
	Thallium, Total	**1.71**	0.5
MW-8D (23'-28')	Magnesium, Dissolved	**104000**	35000
	Manganese, Dissolved	**4911**	300
	Sodium, Dissolved	**272000**	20000
	Iron, Total	**2100**	300
	Magnesium, Total	**95400**	35000
	Manganese, Total	**6395**	300
	Sodium, Total	**275000**	20000

Sample ID	TAL Metals Analyte	Concentration µg/L	NY-AWQS
MW-1S (8'-18')	Magnesium, Dissolved	**38400**	35000
	Sodium, Dissolved	**52300**	20000
	Thallium, Dissolved	**0.51**	0.5
	Iron, Total	**2120**	300
	Sodium, Total	**41500**	20000
	Thallium, Total	**0.51**	0.5
MW-1D (23'-28')	Magnesium, Dissolved	**60000**	35000
	Manganese, Dissolved	**545**	20000
	Sodium, Dissolved	**171000**	20000
	Iron, Total	**648**	300
	Magnesium, Total	**54400**	35000
	Manganese, Total	**418.1**	300
	Sodium, Total	**168000**	20000

LEGEND:

- SOIL BORING LOCATIONS
- NY-AWQS — NEW YORK TECHNICAL AND OPERATIONAL GUIDANCE SERIES 111 AMBIENT WATER QUALITY STANDARDS

NOTES

1. THE BASE MAP IS EXTRACTED FROM THE REMEDIAL INVESTIGATION REPORT BY THE IMPACT ENVIRONMENTAL CLOSURES, INC., DATED JULY, 2020.
2. THE VALUES IN BOLD REPRESENT THE GROUNDWATER SAMPLE VOC EXCEEDING AMBIENT WATER QUALITY STANDARDS.
3. GROUNDWATER INVESTIGATION RESULTS ARE OBTAINED FROM THE JULY 2020 REMEDIAL INVESTIGATION REPORT.

No.	Date	Revision

REVISIONS

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering
611 River Drive - 3rd Floor *Tel: (201) 791-0075*
Elmwood Park, NJ 07407 *Fax: (201) 791-4553*

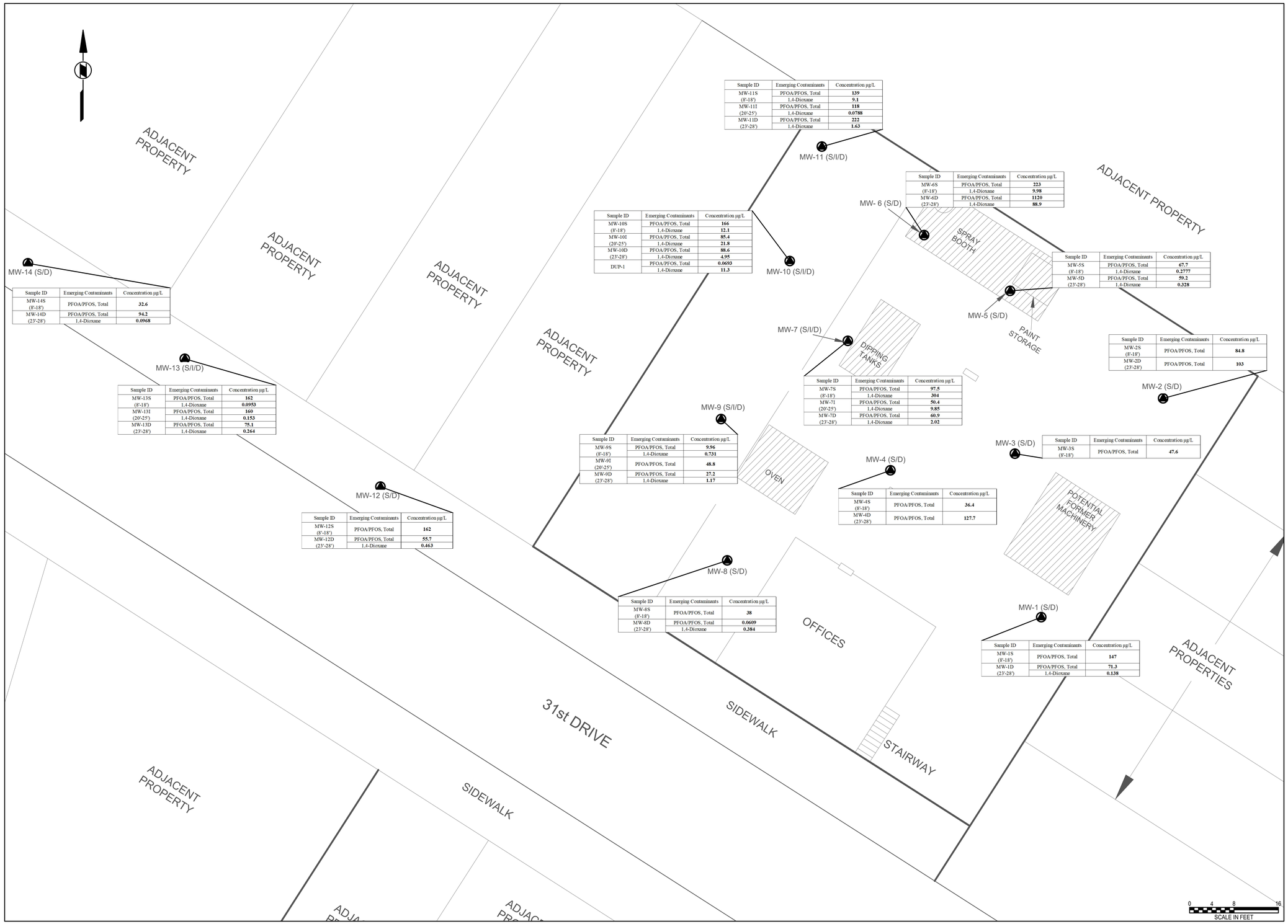
PROJECT:

11-35 31ST DRIVE, ASTORIA, NEW YORK

TITLE: REMEDIAL INVESTIGATION GROUNDWATER SAMPLE METALS EXCEEDANCE MAP

JOB NO: 23094	FIGURE NO: 5
DATE: 08/05/2025	
SCALE: AS SHOWN	
DRAWN BY: ZY	
CHECKED BY:	SHEET 1 OF 1

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Sample ID	Emerging Contaminants	Concentration µg/L
MW-14S (8'-18')	PFOA/PFOS, Total	**32.6**
MW-14D (23'-28')	PFOA/PFOS, Total	**94.2**
	1,4-Dioxane	**0.0968**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-13S (8'-18')	PFOA/PFOS, Total	**162**
	1,4-Dioxane	**0.0953**
MW-13I (20'-25')	PFOA/PFOS, Total	**160**
	1,4-Dioxane	**0.153**
MW-13D (23'-28')	PFOA/PFOS, Total	**75.1**
	1,4-Dioxane	**0.264**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-12S (8'-18')	PFOA/PFOS, Total	**162**
MW-12D (23'-28')	PFOA/PFOS, Total	**55.7**
	1,4-Dioxane	**0.463**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-11S (8'-18')	PFOA/PFOS, Total	**139**
	1,4-Dioxane	**9.1**
MW-11I (20'-25')	PFOA/PFOS, Total	**118**
	1,4-Dioxane	**0.0788**
MW-11D (23'-28')	PFOA/PFOS, Total	**222**
	1,4-Dioxane	**1.63**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-10S (8'-18')	PFOA/PFOS, Total	**166**
	1,4-Dioxane	**12.1**
MW-10I (20'-25')	PFOA/PFOS, Total	**85.4**
	1,4-Dioxane	**21.8**
MW-10D (23'-28')	PFOA/PFOS, Total	**88.6**
	1,4-Dioxane	**4.95**
DUP-1	PFOA/PFOS, Total	**0.0693**
	1,4-Dioxane	**11.3**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-9S (8'-18')	PFOA/PFOS, Total	**9.96**
	1,4-Dioxane	**0.731**
MW-9I (20'-25')	PFOA/PFOS, Total	**48.8**
MW-9D (23'-28')	PFOA/PFOS, Total	**27.2**
	1,4-Dioxane	**1.17**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-8S (8'-18')	PFOA/PFOS, Total	**38**
MW-8D (23'-28')	PFOA/PFOS, Total	**0.0609**
	1,4-Dioxane	**0.384**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-6S (8'-18')	PFOA/PFOS, Total	**223**
	1,4-Dioxane	**9.98**
MW-6D (23'-28')	PFOA/PFOS, Total	**1120**
	1,4-Dioxane	**88.9**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-5S (8'-18')	PFOA/PFOS, Total	**67.7**
	1,4-Dioxane	**0.2777**
MW-5D (23'-28')	PFOA/PFOS, Total	**59.2**
	1,4-Dioxane	**0.328**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-7S (8'-18')	PFOA/PFOS, Total	**97.5**
	1,4-Dioxane	**304**
MW-7I (20'-25')	PFOA/PFOS, Total	**50.4**
	1,4-Dioxane	**9.85**
MW-7D (23'-28')	PFOA/PFOS, Total	**60.9**
	1,4-Dioxane	**2.02**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-2S (8'-18')	PFOA/PFOS, Total	**84.8**
MW-2D (23'-28')	PFOA/PFOS, Total	**103**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-3S (8'-18')	PFOA/PFOS, Total	**47.6**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-4S (8'-18')	PFOA/PFOS, Total	**36.4**
MW-4D (23'-28')	PFOA/PFOS, Total	**127.7**

Sample ID	Emerging Contaminants	Concentration µg/L
MW-1S (8'-18')	PFOA/PFOS, Total	**147**
MW-1D (23'-28')	PFOA/PFOS, Total	**71.3**
	1,4-Dioxane	**0.138**

LEGEND:

SOIL BORING LOCATIONS

NOTES

1. THE BASE MAP IS EXTRACTED FROM THE REMEDIAL INVESTIGATION REPORT BY THE IMPACT ENVIRONMENTAL CLOSURES, INC., DATED JULY, 2020.
2. THE VALUES IN BOLD REPRESENT THE GROUNDWATER SAMPLE VOC EXCEEDING AMBIENT WATER QUALITY STANDARDS.
3. GROUNDWATER INVESTIGATION RESULTS ARE OBTAINED FROM THE JULY 2020 REMEDIAL INVESTIGATION REPORT.

No.	Date	Revision

REVISIONS

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering
611 River Drive - 3rd Floor
Elmwood Park, NJ 07407
Tel: (201) 791-0075
Fax: (201) 791-4533

PROJECT:

11-35 31ST DRIVE, ASTORIA, NEW YORK

TITLE: REMEDIAL INVESTIGATION GROUNDWATER SAMPLE PFAS AND 1,4-DIOXANE EXCEEDANCE MAP

JOB NO: 23094	FIGURE NO: 6
DATE: 08/05/2025	
SCALE: AS SHOWN	
DRAWN BY: ZY	
CHECKED BY:	SHEET 1 OF 1

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Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-21 (0-2)	Tetrachloroethene	0.036	1.3	19
SB-21 (9.5-10)	Tetrachloroethene	0.09	1.3	19
SB-21 (19-19.5)	Tetrachloroethene	0.29	1.3	19
	Methylene Chloride	**0.38**	0.05	100
	Vinyl Chloride	**0.037 J**	0.02	0.9
	cis-1,2-Dichloroethene	**2.6**	0.25	100

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-20 (0-2)	Tetrachloroethene	**1.4**	1.3	19
SB-20 (9.5-10)	Tetrachloroethene	**4.1**	1.3	19
SB-20 (26-26.5)	Tetrachloroethene	**7.7**	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-28 (0-2)	Tetrachloroethene	**2.8**	1.3	19
SB-28 (8-8.5)	Tetrachloroethene	**4.7**	1.3	19
SB-28 (23-23.5)	Tetrachloroethene	0.051	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-26 (0-2)	Tetrachloroethene	**11**	1.3	19
SB-26 (7-7.5)	Tetrachloroethene	0.85	1.3	19
SB-26 (15-15.5)	Tetrachloroethene	**1.4**	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-29 (0-2)	Tetrachloroethene	0.056	1.3	19
SB-29 (19.2-20)	Tetrachloroethene	0.016	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-27 (0-2)	Tetrachloroethene	**3.5**	1.3	19
SB-27 (13.5-14)	Tetrachloroethene	0.96	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-19 (0-2)	Tetrachloroethene	0.015	1.3	19
SB-19 (9.5-10)	Tetrachloroethene	0.034	1.3	19
SB-19 (22-22.5)	Tetrachloroethene	0.093	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-18 (0-2)	Tetrachloroethene	0.057	1.3	19
SB-18 (9-9.5)	Tetrachloroethene	4.8	1.3	19
SB-18 (25-25.5)	Tetrachloroethene	**16.9**	1.3	19
	Methylene Chloride	**0.17 J**	0.05	100

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-25 (0-2)	Tetrachloroethene	0.082	1.3	19
SB-25 (7-7.5)	Tetrachloroethene	0.12	1.3	19
SB-25 (15-15.5)	Tetrachloroethene	0.16	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-22 (0-2)	Tetrachloroethene	0.12	1.3	19
SB-22 (9.5-10)	Tetrachloroethene	**2.3**	1.3	19
	cis-1,2-Dichloroethene	**2.5**	0.25	100
SB-22 (18.5-19)	Tetrachloroethene	**23**	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-24 (3.5-4)	Tetrachloroethene	**13**	1.3	19
SB-24 (8-8.5)	Tetrachloroethene	0.092	1.3	19
SB-24 (13-14)	Tetrachloroethene	**8.6**	1.3	19
SB-24 (21-21.5)	Tetrachloroethene	**340000**	1.3	19
	1,1,1-Trichloroethane	**470 J**	0.68	100
	Trichloroethane	**830**	0.47	21
	cis-1,2-Dichloroethene	**500 J**	0.25	100
	1, 3, 5-Trimethylbenzene	**380 J**	8.4	52
	1, 2, 4-Trimethylbenzene	**520 J**	3.6	52

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-16 (0-2)	Tetrachloroethene	0.41	1.3	19
	Methylene Chloride	**0.14 J**	0.05	100
SB-16 (9.5-10)	Tetrachloroethene	0.88	1.3	19
SB-16 (20-20.5)	Tetrachloroethene	0.7	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-31 (0-2)	Tetrachloroethene	**1.7**	1.3	19
SB-31 (8-8.5)	Tetrachloroethene	0.92	1.3	19
SB-31 (19-19.5)	Tetrachloroethene	0.16	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-13 (0-2)	Tetrachloroethene	0.11	1.3	19
SB-13 (9.5-10)	Tetrachloroethene	0.44	1.3	19
SB-13 (14-14.5)	Tetrachloroethene	0.11	1.3	19
SB-13 (25-25.5)	Tetrachloroethene	0.16	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-12 (0-2)	Tetrachloroethene	0.17	1.3	19
SB-12 (8.5-9)	Tetrachloroethene	1.2	1.3	19
SB-12 (25-25.5)	Tetrachloroethene	0.14	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-10 (0-2)	Tetrachloroethene	0.019	1.3	19
SB-10 (8.5-9)	Tetrachloroethene	0.38	1.3	19
SB-10 (25-25.5)	Tetrachloroethene	0.0076	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-11 (0-2)	Tetrachloroethene	**3.2**	1.3	19
SB-11 (9-9.5)	Tetrachloroethene	**1.6**	1.3	19
SB-11 (25-25.5)	Tetrachloroethene	0.28	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-9 (0-2)	Tetrachloroethene	0.003	1.3	19
SB-9 (9-9.5)	Tetrachloroethene	1.1	1.3	19
SB-9 (25-25.5)	Tetrachloroethene	0.013	1.3	19

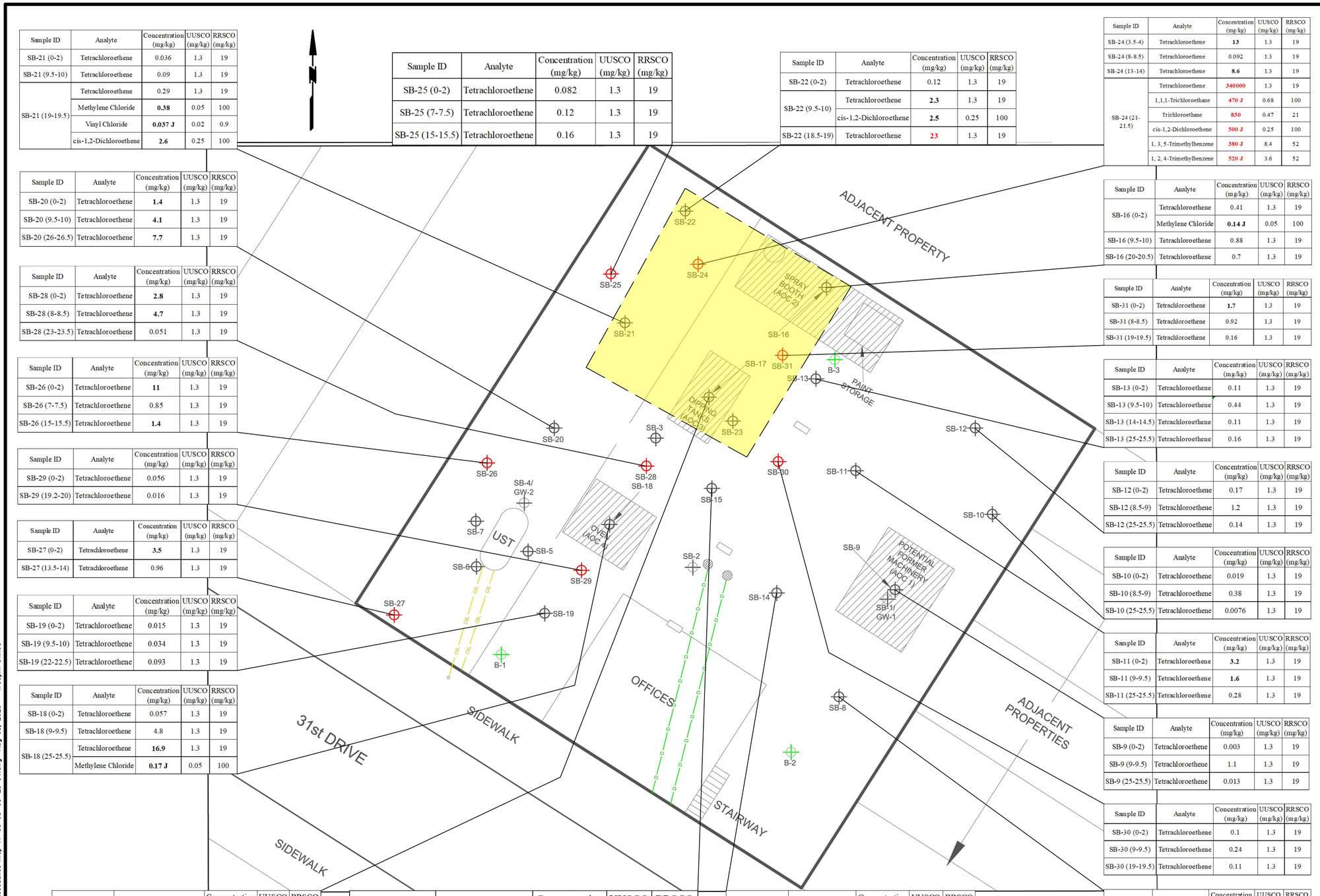
Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-30 (0-2)	Tetrachloroethene	0.1	1.3	19
SB-30 (9-9.5)	Tetrachloroethene	0.24	1.3	19
SB-30 (19-19.5)	Tetrachloroethene	0.11	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-8 (0-2)	Tetrachloroethene	0.0012	1.3	19
SB-8 (9-9.5)	Tetrachloroethene	ND	1.3	19
SB-8 (27-27.5)	Tetrachloroethene	0.0027	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-17 (9.5-10)	Tetrachloroethene	**7900**	1.3	19
	Ethylbenzene	**10 J**	1.3	19
	Xyelene	**3.6 J**	0.26	100
	1, 3, 5-Trimethylbenzene	**29 J**	8.4	52
	1, 2, 4-Trimethylbenzene	**53 J**	3.6	52
SB-17 (25-25.5)	Tetrachloroethene	0.32	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-15 (0-2)	Tetrachloroethene	**1.9**	1.3	19
SB-15 (9-9.5)	Tetrachloroethene	0.85	1.3	19
SB-15 (15-15.5)	Tetrachloroethene	**1.9**	1.3	19
SB-15 (27.5-28)	Tetrachloroethene	0.068	1.3	19

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
SB-14 (0-2)	Tetrachloroethene	0.036	1.3	19
SB-14 (9-9.5)	Tetrachloroethene	0.041	1.3	19
SB-14 (23.5-24)	Tetrachloroethene	0.018	1.3	19



NOTES:

1. BASE PLAN WAS EXTRACTEDFROM THE SAMPLE LOCATION MAP OF REMEDIAL INVESTIGATION REPORT BY IMPACT ENVIRONMENTAL CLOSURE DATED JULY 31, 2020.

LEGEND:

Site Boundary — PCE Hotspot Area

SB-10 — Soil Boring Location

UUSCO = New York State Department of Environmental Conservation Unrestricted Use Soil Cleanup Objective

RRSCO = New York State Department of Environmental Conservation Restricted Use Soil Cleanup Objective - Restricted Residential

2.8 - Analyte has exceeded UUSCO

7000 - Analyte has exceeded RRSCO

No.	Date	Revision

REVISIONS

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering
611 River Drive - 3rd Floor
Elmwood Park, NJ 07407
Tel: (201) 791-0075
Fax: (201) 791-4533

PROJECT:

11-35st Drive
Astoria, New York

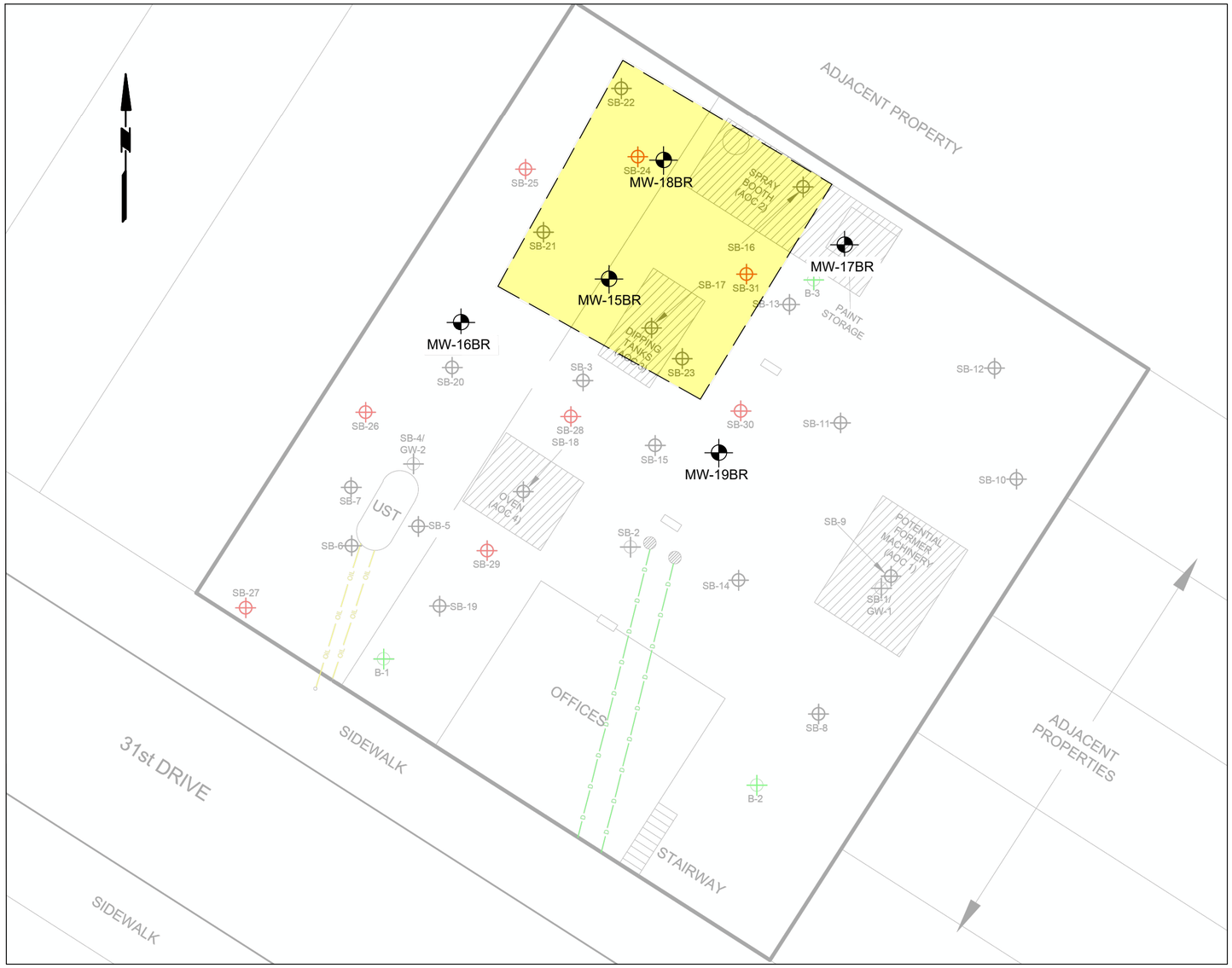
TITLE:

PCE HOTSPOT AREA DELINEATION MAP

JOB NO: 23049	FIGURE NO: 7
DATE: 08/05/2025	
SCALE: 1" = 12'	
DRAWN BY: MR	
CHECKED BY: CH	SHEET OF

BSCAN

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NOTES:

1. BASE PLAN WAS EXTRACTEDFROM THE SAMPLE LOCATION MAP OF REMEDIAL INVESTIGATION REPORT BY IMPACT ENVIRONMENTAL CLOSURE DATED JULY 31, 2020.
2. THE PROPOSED BEDROCK WELL WILL BE ADVANCED TO 10 FT BELOW THE BEDROCK LEVEL WHICH RANGES FROM 24 FT TO 33 FT BGS.

LEGEND:

- Site Boundary
- PCE Hotspot Area
- SB-10 — Soil Boring Location
- MW-16BR — Proposed Bedrock Groundwater Permanent Well Location

No.	Date	Revision

REVISIONS

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering
611 River Drive - 3rd Floor
Elmwood Park, NJ 07407
Tel: (201) 791-0075
Fax: (201) 791-4533

PROJECT:

11-35st Drive
Astoria, New York

TITLE:

Proposed Bedrock Well Location Plan

JOB NO: 23049	FIGURE NO: 8
DATE: 08/05/2025	
SCALE: 1" = 12'	
DRAWN BY: MR	
CHECKED BY: CH	SHEET OF

BSCAN

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TABLES

TABLE 1
GROUNDWATER SAMPLING PROGRAM SUMMARY
11-35 31st Drive
Astoria, New York

Sample ID	Well Type	Matrix	Anticipated Depth to Bedrock (ft bgs)	Screen Interval	Sampling Method	Sampling Rationale	Number of Samples	Analytical Parameter
MW-15BR	Permanent	GW	30-33	6-16 ft below the competent bedrock	Low-Flow Sampling	Investigate bedrock groundwater conditions within the PCE hotspot area (elevated PCE detections in both saturated soil and groundwater) in the northwestern portion of the Site, adjacent to the former dipping tanks.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-16BR	Permanent	GW	25-30	6-16 ft below the competent bedrock	Low-Flow Sampling	Investigate bedrock groundwater conditions downgradient of the PCE hotspot area in the western portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-17BR	Permanent	GW	30-33	6-16 ft below the competent bedrock	Low-Flow Sampling	Investigate bedrock groundwater conditions upgradient of the PCE hotspot area in the eastern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-18BR	Permanent	GW	30-33	6-16 ft below the competent bedrock	Low-Flow Sampling	Investigate bedrock groundwater conditions within the PCE hotspot area in the northwestern portion of the Site, adjacent to the highest PCE detection in soil boring SB-24 from the previous remedial investigation.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane

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GROUNDWATER SAMPLING PROGRAM SUMMARY
11-35 31st Drive
Astoria, New York

Sample ID	Well Type	Matrix	Anticipated Depth to Bedrock (ft bgs)	Screen Interval	Sampling Method	Sampling Rationale	Number of Samples	Analytical Parameter
MW-19BR	Permanent	GW	30-33	6-16 ft below the competent bedrock	Low-Flow Sampling	Investigate bedrock groundwater conditions side-gradient of the PCE hotspot area in the center portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-1S	Permanent	GW	30-34	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the southeastern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-1D	Permanent	GW	30-34	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the southeastern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-2S	Permanent	GW	25-30	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions up-gradient of the PCE hotspot area in the northeastern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane

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Astoria, New York

Sample ID	Well Type	Matrix	Anticipated Depth to Bedrock (ft bgs)	Screen Interval	Sampling Method	Sampling Rationale	Number of Samples	Analytical Parameter
MW-2D	Permanent	GW	25-30	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions up-gradient of the PCE hotspot area in the northeastern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-3S	Permanent	GW	27-30	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions up-gradient of the PCE hotspot area in the northeastern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-3D	Permanent	GW	27-30	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions up-gradient of the PCE hotspot area in the northeastern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-4S	Permanent	GW	25-28	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the center portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane

TABLE 1
GROUNDWATER SAMPLING PROGRAM SUMMARY
11-35 31st Drive
Astoria, New York

Sample ID	Well Type	Matrix	Anticipated Depth to Bedrock (ft bgs)	Screen Interval	Sampling Method	Sampling Rationale	Number of Samples	Analytical Parameter
MW-4D	Permanent	GW	25-28	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the center portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-5S	Permanent	GW	27-29	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions up-gradient of the PCE hotspot area in the north portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-5D	Permanent	GW	27-29	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions up-gradient of the PCE hotspot area in the north portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-6S	Permanent	GW	27-29	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the northwestern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane

TABLE 1
GROUNDWATER SAMPLING PROGRAM SUMMARY
11-35 31st Drive
Astoria, New York

Sample ID	Well Type	Matrix	Anticipated Depth to Bedrock (ft bgs)	Screen Interval	Sampling Method	Sampling Rationale	Number of Samples	Analytical Parameter
MW-6D	Permanent	GW	27-29	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the northwestern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-7S	Permanent	GW	27-29	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the center portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-7I	Permanent	GW	27-29	20-25 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the center portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-7D	Permanent	GW	27-29	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the center portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane

TABLE 1
GROUNDWATER SAMPLING PROGRAM SUMMARY
11-35 31st Drive
Astoria, New York

Sample ID	Well Type	Matrix	Anticipated Depth to Bedrock (ft bgs)	Screen Interval	Sampling Method	Sampling Rationale	Number of Samples	Analytical Parameter
MW-8S	Permanent	GW	18-20	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions down-gradient of the PCE hotspot area in the southwest portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-8D	Permanent	GW	18-20	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions down-gradient of the PCE hotspot area in the southwest portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-9S	Permanent	GW	25-27	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions down-gradient of the PCE hotspot area in the southwest portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-9I	Permanent	GW	25-27	20-25 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions down-gradient of the PCE hotspot area in the southwest portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane

TABLE 1
GROUNDWATER SAMPLING PROGRAM SUMMARY
11-35 31st Drive
Astoria, New York

Sample ID	Well Type	Matrix	Anticipated Depth to Bedrock (ft bgs)	Screen Interval	Sampling Method	Sampling Rationale	Number of Samples	Analytical Parameter
MW-9D	Permanent	GW	25-27	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions down-gradient of the PCE hotspot area in the southwest portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-10S	Permanent	GW	25-27	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the northwestern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-10I	Permanent	GW	25-27	20-25 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the northwestern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-10D	Permanent	GW	25-27	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the northwestern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane

TABLE 1
GROUNDWATER SAMPLING PROGRAM SUMMARY
11-35 31st Drive
Astoria, New York

Sample ID	Well Type	Matrix	Anticipated Depth to Bedrock (ft bgs)	Screen Interval	Sampling Method	Sampling Rationale	Number of Samples	Analytical Parameter
MW-11S	Permanent	GW	30-33	8-18 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the northwestern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-11I	Permanent	GW	30-33	20-25 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the northwestern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
MW-11D	Permanent	GW	30-33	23-28 ft below existing grade	Low-Flow Sampling	Investigate on-site groundwater conditions side-gradient of the PCE hotspot area in the northwestern portion of the Site.	1	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
QA/QC	-	GW		-	-	Trip Blanks	1	TCL VOCs

TABLE 1
GROUNDWATER SAMPLING PROGRAM SUMMARY
11-35 31st Drive
Astoria, New York

Sample ID	Well Type	Matrix	Anticipated Depth to Bedrock (ft bgs)	Screen Interval	Sampling Method	Sampling Rationale	Number of Samples	Analytical Parameter
QA/QC	-	GW		-	-	Field Duplicate, Matrix Spike, Matrix Spike duplicate, Equipment Blank	4	TCL VOCs, TCL SVOCs, TAL Metals including hexavalent and trivalent chromium, PCBs & Pesticides, Cyanide, PFAS and 1,4-Dioxane
Total	-	-		-	-	-	36	

Notes:
1. Analyses will be performed via USEPA SW-846 methodology with equivalent Category B deliverables package.
2. Trip blanks will be used each trip that aqueous volatile organic samples are shipped.
3. Field duplicate and matrix spike/matrix spike duplicate samples will be collected at a frequency of 1 per 20 samples per media collected.
4. ft bgs - feet below ground surface

TABLE 2
PROJECT SCHEDULE
11-35 31st Drive
Astoria, New York

Schedule Milestone	Weeks from Supplemental Investigation Start	Duration (weeks)
DEC Approval of SRIWP	0	4
Mobilization	4	4
Supplemental Remedial Investigation	8	2
Receipt of Sample Results	10	2
Receipt of Data Usability Report	12	4
Submit Supplemental Remedial Investigation Report	16	4
Submit Revised Remedial Action Work Plan	20	4

Table 3
List of Site Contact
Supplemental Remedial Investigation Work Plan
11-35 31st Drive
Queens, NY 11106
Project No. 23094

Title	Name	Email Address	Phone Number
Program Manager/Remediation Engineer	Sixuan Wang	swang@yu-associates.com	(201) 773-9621
Qualified Environmental Professional (QEP)	Chengyu Hang	chang@yu-associates.com	(201) 873-7543
Corporate Health & Safety Officer (CHSO)	Stephen Everest	severest@yu-associates.com	(201) 773-9609
Field Health & Safety Officer (HSO)	David Huang	dhuang@yu-associates.com	(732) 567-5052
NYSDEC Spill Hotline	—	contact@dec.ny.gov	(800) 457-7362
NYSDEC Project Manager	Erick Bower	Erick.Bower@dec.ny.gov	(518) 402-9824
NYSDOH Project Manager	Mike Izdebski	Michael.Izdebski@health.ny.gov	(518) 408-1018
Drilling and Well Installation Contractor	Shawn Miller	smiller@cascade-env.com	(516) 616-6026
Borehole Geophysical Survey Contractor	Levent Eskicakit	levent@novagsi.com	(347) 556-7787
Laboratory	Rich August	Rich.August@ALSGlobal.com	(203) 325-1371
Data Usability Validator	Maxine Wright-Walters	mwalters@edv-inc.com	(412) 341-5281
Owner	Qing Li	lqing@metawaygroup.com	(914) 343-0460

APPENDICES

APPENDIX A -NYSDEC MODIFICATION REQUEST

NEW YORK STATE | Department of Environmental Conservation

KATHY HOCHUL
Governor

AMANDA LEFTON
Acting Commissioner

Transmitted via e-mail

April 2, 2025

Li Qing
Astoria Riverside Park LLC
280 N Central Ave, STE. 110
Hartsdale, NY 10530
lqing@metawaygroup.com

Re: Supplemental Remedial Investigation Work Plan, December 2024
Site: Former Kenneth Trading Corp. Facility
Site No.: C241215
Location: 11-35 31St Drive, Astoria, NY 11106

Dear Li Qing,

The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), has completed a review of the Supplemental Remedial Investigation Work Plan (SRIWP) dated December 2024 for the Former Kenneth Trading Corp. Facility site, Site No. C241215, under the Brownfield Cleanup Program (BCP). In accordance with 6 NYCRR Part 375 1.6(d)(3), the NYSDEC requests the following modifications be made to the SRIWP:

General Comments:

Modification 1, Certification: The work plan must be certified in accordance with DER-10.

Modification 2, Work Plan Title: Both the schedule table and the headers on the appendices' title pages still list the work plan as a "RIWP" or "Supplemental Investigation Work Plan". Please correct this to "S**R**IWP" or "Supplemental **Remedial** Investigation Work Plan".

Modification 3, Background Information: Per the requirements of DER-10, please discuss the following in the body of the text:

a) Any other known contaminated or spill sites in this area. Please indicate if any reported spills on-site are open or closed.
b) Any major infrastructure on-site and whether this may influence contaminant migration off-site.

Modification 4, Site Contact List: Please provide a list of contact information for relevant personnel associated with the site. This can be included within the SRIWP or within the appendices. Include the following:

- NYSDEC PM
- NYSDOH PM
- Relevant personnel from the environmental consulting firm
- Point of contact for any subcontractors
- Point of contact for any labs and data validators
- Point of contact for the owner/applicant

Modification 5, Sample/Well Installation Consistency: Ensure that the text and tables are consistent regarding both well design and sampling. Please correct Table 1 to indicate that wells will be installed such that screens are from 6 to 16 feet below the competent bedrock encountered, per Modification 4C from the October 18, 2024 Comment Letter. Again, this allows for the bentonite seal to cover the transition from the steel casing to bare bedrock

Modification 6, Groundwater Sampling: The latest analytical groundwater data collected at the site is from 2019, which is more than five years ago now. Newer data is necessary to inform our understanding of current concentrations as well as contaminant migration. As such, the workplan must be modified to include a round of groundwater sampling at all on-site wells. All existing on-site monitoring wells must be sampled along with the proposed bedrock wells.

Modification 7, Groundwater Sample Analysis: Please specify that full-suite analysis will be carried out on all groundwater samples: VOCs, SVOCs, Metals (including mercury, hex-chrome, and tri-chrome), Pesticides, PCBs, PFAS, Cyanide, and 1,4-Dioxane.

Modification 8, Geophysics Contractor: Please identify the proposed geophysics contractor and include the qualifications of the personnel performing the geophysical survey and data processing work (this information can be provided within the appendices if desired).

Modification 9, Geophysical Investigation Purpose: Currently, the text states that the goal of the geophysical bedrock survey is, "*to identify fractures and detect groundwater flow in the bedrock*" (see Section 4.1, paragraph 2). Please be advised that the purpose of the geophysical bedrock survey is to characterize the bedrock and any structural features present and to evaluate the movement of water throughout the bedrock regime to identify the potential for contaminant migration within the bedrock groundwater and to help determine the feasibility of potential future groundwater treatment. Please update the text accordingly.

Modification 10, Geophysical Investigation Details: Please have the geophysics contractor provide a supplemental plan (to be included as an appendix), outlining the specifics of the geophysical bedrock investigation. Ensure that the text of the SRIWP

references this appendix. Included below are some specific details that NYSDEC will be looking for in this supplemental plan:

a) Revise language to include a statement that, aside from completing core logs, the field staff overseeing coring activities will be screening the work area with a PID and will also note any water level changes observed in each borehole during coring activities. If a sudden change in water level is observed, the drilling depth at which the water level change occurred, and the time of the observation will be documented. This observational information should be included on the corresponding borehole log and in the summary report.

b) Once borehole coring is complete, the wells need to be developed to a target turbidity to 5 NTU or less. Generated development water must be containerized and handled appropriately as IDW.

c) Include procedures to mitigate the risk of vertically spreading contamination during the drilling and well installation processes. Additionally, revise the work plan to provide a contingency in case it becomes necessary to modify or halt work activities to prevent or minimize the unforeseen introduction of contaminants into an uncontaminated area (i.e. sealing a zone within a borehole, or the entire borehole, with a bentonite/ slurry grout to stop contaminant migration).

d) As a minimum, the following geophysical parameters must be recorded as part of the survey, with corresponding logs provided:

- **i.** temperature,
- **ii.** single-point resistivity,
- **iii.** spontaneous potential,
- **iv.** fluid conductivity,
- **v.** natural gamma,
- **vi.** caliper,
- **vii.** optical televiewer,
- **viii.** acoustic televiewer, and
- **ix.** vertical flowmeter measurements (both unstressed and stressed).

The scope of work should state how each parameter (log method) will be used to meet the objectives of the survey, as well as a discussion of properties measured, potential applications, required borehole conditions, limitations, and a description or statement(s) regarding data processing. The scope should also include a description of the software to be used to digitize the collected data as well as how the data will be presented in a summary report, i.e., rose diagrams, stereonets, hemisphere plots, etc.

e) The scope of work should state what kind of flowmeter will be employed, its capabilities (i.e., measures flow up and down the borehole), and its measurement range.

f) The scope of work must include plans to collect water level measurements in surrounding site boreholes and wells, including a baseline (pre-coring/pumping), and additional measurements during any borehole pumping (whether development or during stressed flowmeter testing). This will aid in determining connectivity within the bedrock regime, if any. This groundwater measurement data should be included in the summary report.

Specific Comments:

Modification 11, Section 1.0 (Introduction): Language in this section currently states that historic documents are provided in Appendix A. However, Appendix A of the document currently contains the Health and Safety Plan (HASP), and historic documents have not been provided elsewhere. Please revise the document to include the mentioned historic documents as an appendix and correct this reference.

Modification 12, Section 3.0 (Summary of Field Activities): Please make the following edits:

- **a)** This section does not currently include surveying as a general field activity. Please update this section to include surveying. Reference elevations for all monitoring wells must be surveyed so that groundwater water level measurements can be made to the near 0.01 feet.
- **b)** Within the first paragraph, please replace the language "*well purging*" with "*well development*".
- **c)** The Quality Assurance Project Plan (QAPP) and the Field Sample Plan (FSP) are referenced from the 2019 Remedial Investigation Work Plan (RIWP). Please update the document to include the QAPP and FAP as appendices to the SRIWP and revise all related references throughout the document.
- **d)** Please remove the sentence, "*Field discretion will be used to determine the final number of borings as well as samples to be analyzed.*"

Modification 13, Section 3.4 (Decontamination Procedures and IDW Management): Please revise the language in this section to state that all non-dedicated equipment will be decontaminated before leaving the site.

Modification 14, Section 4.1 (Bedrock Well Installation): As part of the drilling process, the following items should also be included:

- **a)** Perform bedrock coring.
- **b)** Collect rock cores for analysis and logging.

Modification 15, Section 4.2.2 (Groundwater Sampling): The criteria for stabilization referenced in this section are not in line with low-flow groundwater sampling stabilization criteria. Please update the text to be consistent with low-flow groundwater sampling stabilization criteria.

Modification 16, Section 6.0 (Project Management): Please make the following edits:

- **a)** The text currently states that project management will follow the same program as established in the NYSDEC approved RIWP. Please include additional language to provide the details of this program as it applies to the SRIWP.
- **b)** A site-specific Community Air Monitoring Plan (CAMP) should be referenced in this section and included in the SRIWP. Special requirements language is needed for ground intrusive work conducted within 20 feet of sensitive receptors, occupied structures, etc. within the area. An example is enclosed for your reference.
- **c)** Adjust language within this section to indicate that the work will take place under the included HASP (prepared by Yu & Associates) and reference the appropriate appendix.

Modification 17, Section 7.0 (Reporting): Please revise this section to state that daily progress reports will be submitted to NYSDEC and NYSDOH.

Modification 18, Section 7.0 (Reporting): On days that borehole geophysical survey work is being completed, the preliminary (raw) geophysical data from that day must be provided to NYSDEC as soon as it is available. Ideally this data should be sent within 24 hours, if possible (alongside the daily report).

Modification 19, Figures: Please complete the following modifications to the Figures section of the SRIWP:

- **a)** Provide a Site Location Map and a Site Plan figure within the main Figures section of the SRIWP. It would be sufficient to copy over Figures 1 and 2 from the CAMP (Appendix B).
- **b)** Please provide a figure that displays the groundwater monitoring wells installed under previous investigations and all associated groundwater exceedances. Provide footnotes that reference the original investigation.
- **c)** To improve clarity, please reduce the contrast of prior soil boring locations shown on the “Proposed Bedrock Well Location Plan” figure. This will make it clearer which icons represent the locations of newly proposed work.
- **d)** An additional bedrock monitoring well/geophysics sampling location must be included east of SB-15 and south of SB-30.

Modification 20, Table 1 (Groundwater Sampling Program Summary): This table currently indicates that the groundwater sampling method will be a well purge/grab. Please update the text to indicate low-flow groundwater sampling.

Modification 21, Appendix A (Health and Safety Plan): Please provide language in the Health and Safety Plan (HASP) outlining specific procedures for pedestrian protection while mobilizing equipment on and off-site.

Modification 22, Appendix B (Community Air Monitoring Plan): Appendix 1B of DER-10 (Fugitive Dust and Particulate Monitoring) must be included in the Community

Air Monitoring Plan (CAMP). Please include Appendix 1B of DER-10 as an attachment within the CAMP.

Modification 23, Appendices: The current version of the SRIWP fails to include Appendix C (Field Forms). Please correct this issue so that this appendix is properly included.

In accordance with 6 NYCRR Part 375-1.6(d)(3), should the Volunteer elect to modify the SRIWP, please notify the NYSDEC in writing within 15 days of receipt of this letter and provide the updated SRIWP within 30 days of the receipt of this letter. In your response, please include a response to comment letter which indicates how each modification has been incorporated into the updated SRIWP. Please be advised that following resubmission, the revised SRIWP will be subject to further technical review by NYSDEC and NYSDOH.

If you have any questions or concerns, please contact Erick Bower by phone at (518) 402-9824 or by email at erick.bower@dec.ny.gov.

Sincerely,

Erick Bower
Project Manager
Remedial Bureau B, Section B
Division of Environmental Remediation

Enclosure:

Special Requirements CAMP.pdf

ec:

Jane O'Connell, NYSDEC (jane.oconnell@dec.ny.gov)
Scott Deyette, NYSDEC (scott.deyette@dec.ny.gov)
William Bennett, NYSDEC (william.bennett@dec.ny.gov)
Erick Bower, NYSDEC (erick.bower@dec.ny.gov)
Michael Izdebski, NYSDOH (michael.Izdebski@health.ny.gov)
Scarlett McLaughlin, NYSDOH (scarlett.mclaughlin@health.ny.gov)
Sixuan Wang, YU & Associates Engineers, P.C. (swang@yu-associates.com)
DECDOCS

APPENDIX B -FSP

APPENDIX B

FIELD SAMPLING PLAN

Former Kenneth Trading Corp. Facility

11-35 31st Street, Astoria NY 11106Block 503, Lot 41
Site ID: C241215

Submitted to:

New York State Department of Environmental Conservation

Division of Environmental Remediation

Remedial Bureau B, 12th Floor

625 Broadway

Albany, New York 12233-7016
Attention: Mr. Steven Li

Prepared for:

Astoria Riverside Park, LLC

280 N. Central Avenue, Ste.110Hartsdale, New York 10530

Prepared by:

YU & Associates Engineers, P.C.

611 River Drive, 3rd Floor Elmwood Park, NJ 07407

July 30, 2025

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this Field Sampling Plan (FSP) is to describe activities planned for the field sampling and related activities of the supplemental remedial investigation (SRI) at the 11-35 31st Drive, Astoria, New York (hereafter referred to as the "Site") to include in the Supplemental Remedial Investigation Work Plan (SRIWP) as an Appendix. The work will be performed in accordance with New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation DER-10 Technical Guidance for Remedial Investigation and Remediation (May 2010). The FSP provides detailed procedures for the collection of soil and groundwater samples.

The quality assurance protocols applicable to this project are presented in the Quality Assurance Project Plan (QAPP), provided as Appendix C of the SRIWP. The health and safety plan (HASP) is provided as Appendix D of the SRIWP.

1.2 SITE DESCRIPTION

The Site is located in the County of Queens, New York City, New York and is identified as Block 503 and Lot 41 on the New York City Tax Map. The Site is situated on an approximately 0.23-acre area at 11-35 31st Drive. The Site is bound by a multi-story residential apartment building with a two-story parking garage to the north; 31st Drive and residential and light industrial buildings to the south; an asphalt paved parking lot and multi-family residential apartment buildings to the east, and an outdoor recreation area to the west. The subject Site was initially developed as early as 1898 and utilized as a residence through at least the 1950s. The original warehouse building was constructed circa 1959 after which the Site was utilized as a commercial facility. A steel works had occupied the Site from 1967 to 2010. After which, two commercial transportation companies occupied the Site in 2014. The site is currently vacant.

1.3 SITE ACCESS

YU & Associates Engineers, P.C. (YU) has obtained the necessary permissions and access agreements to perform all field activities associated with the implementation of the SRIWP. This includes access to conduct drilling, soil sampling, bedrock monitoring well installation, development and sampling, borehole geophysical survey work, well survey, and existing well development and sampling. Coordination with property owners and site representatives will continue throughout the investigation to ensure safe and uninterrupted access during the scheduled fieldwork.

2.0 GENERAL FIELD ACTIVITIES

The following field activities will be performed as part of the SRI sampling:

- One-Call utility mark-out,
- Geophysical survey,
- Perimeter air quality monitoring for VOCs and particulates for the duration of field activities that would produce organic vapors or airborne particulates, in the interest of ensuring ambient and work space air quality and providing for on-site personnel and public safety,
- The collection of soil samples,

- Borehole geophysical survey,
- The bedrock monitoring wells installation and development,
- Existing monitoring well development,
- Well survey,
- The collection of groundwater sample via bedrock monitoring wells and existing monitoring wells, and
- Investigation derived waste (IDW) disposal, surveying, and other activities auxiliary to permanent well installation, sampling and development.

2.1 MOBILIZATION

Following approval of the SRIWP from NYSDEC and notice to proceed with the field work, YU will mobilize necessary materials and equipment to the Site.

A project kick-off meeting will be held prior to initiating field work to orient field team members and subcontractors with the Site and to familiarize YU personnel and our subcontractor personnel with site background, scope of work, potential dangers, health and safety requirements, emergency contingencies and other field procedures.

2.2 DECONTAMINATION PROCEDURES AND HANDLING OF IDW

All drilling equipment will be steam cleaned prior to installation of the next monitoring well. All dedicated equipment and tools used to develop monitoring wells or collect samples for chemical analysis will be decontaminated prior to and between each sample interval using an Alconox rinse and potable water rinse prior to reuse.

A temporary decontamination area lined with polyethylene sheeting will be constructed on site for use during decontamination of the drilling and sampling equipment. Investigation derived waste (IDW) consisting of soil cuttings and purge water will be staged in appropriate containers and analyzed to determine the appropriate disposal methods. Based on the analytical results, YU will dispose of the IDW at a NYSDEC approved disposal facility. All non-dedicated equipment will be decontaminated before leaving the site.

2.3 UTILITY CLEARANCE AND GEOPHYSICAL SURVEY

Prior to the initiation of subsurface borings, a utility mark out will be ordered by the contractor performing the borings. A geophysical survey will be performed using ground penetrating radar (GPR), various utility locators, and ferrous-metal detectors to clear proposed boring locations, locate on-site underground utilities, and identify potential structures within the subsurface.

3.0 SOIL SAMPLING PROCEDURES

Soil investigation and sampling will be done in compliance with NYSDEC's DER-10 "Technical Guidance for Site Investigation and Remediation" (NYSDEC, May 2010). This section outlines the procedures that will be used in soil sampling.

Drilling will be performed under the supervision of a YU field environmental representative. Prior to advancement, the YU field environmental representative will confirm, based on available information, that the locations of the borings will not pose any danger to underground utilities or

overhead obstructions. If required, proposed borings will be relocated nearby to avoid these hazards.

3.1 SOIL SAMPLING

The boreholes for the bedrock wells will be advanced using a double-casing rotary-vibratory (sonic) drilling rig that can advance through overburden soil/fill and bedrock. The sonic tooling will consist of an 8-inch core barrel with a 10-inch override casing to provide a continuous core across the entire length of the borehole. Continuous soil sampling will be performed using 2-foot split-spoons or shelby tubes. The soils will be screened with photoionization detector (PID) and logged in the field by a YU field engineer, and one soil sample will be collected from the most impacted interval based on (PID) screening and field observations from each boring. The soil sample will be analyzed for TCL VOCs only.

Samples will be collected with laboratory-supplied, pre-cleaned sample containers, placed in storage/transportation coolers, preserved with ice, kept at the temperature of 4°C, and shipped under proper chain of custody procedures to a certified laboratory for analysis.

4.0 GROUNDWATER SAMPLING PROCEDURES

Groundwater investigation and sampling will be done in compliance with NYSDEC's DER-10 "Technical Guidance for Site Investigation and Remediation" (NYSDEC, May 2010). This section outlines the procedures that will be used in groundwater sampling.

4.1 BEDROCK MONITORING WELL INSTALLATION

After the completion of the bedrock geophysical survey, the bedrock groundwater monitoring wells will be installed in the borehole using 10 feet of 4-inch diameter, 0.02-slot PVC well screen starting from 6 ft to 16 ft below the competent bedrock and completed using 4-inch PVC well riser to the ground surface. The annular space will be filled with filter sand extending 1 foot above the well screen, followed by 2 feet of bentonite above the filter sand and a cement-bentonite grout to ground surface. Each well will be finished at grade with a locking well cap and flush mount cover. If NAPL is encountered in the bedrock, the monitoring well will be converted to recovery wells.

4.2 PERMANENT MONITORING WELL DEVELOPMENT AND GAUGING

Following installation, each bedrock groundwater monitoring well and existing on-site monitoring wells will be developed to achieve hydraulic connection between the formation and the well screen. A submersible pump or a peristaltic pump will be used for development at each well. During development, the field supervisor will record development information on the Well Sampling and Purging form, provided in Appendix C. Periodic readings (every five to ten minutes) will include depth to water, pumping rate, temperature, pH, conductivity and turbidity. The wells will be developed using a surge and pump method such that the pH and conductivity of the groundwater stabilize and the turbidity reading of 5 nephelometric turbidity units (NTU) or less, or until at least three well volumes have been purged from the well. Development water will be containerized and managed as investigation-derived waste (IDW) in accordance with applicable state and federal regulations.

If stabilization is not achieved after more than three well volumes of purging, the field team leader will notify the YU Project Manager who will make a decision on when to terminate the purging (unless default contingencies are established in advance). In low yield wells, the sample may be collected after the well recharges if purged dry. Pumped or purged water will be contained and

properly disposed. Following development, wells will be allowed to recover for at least 14 days before groundwater is purged and sampled. Permanent monitoring well development will be performed or overseen by a field geologist and recorded in the field book.

Immediately prior to the groundwater sampling, the depth to water in each monitoring well will be gauged to provide information on groundwater flow in the vicinity of the Site. Water level measurements will be recorded in the field notebook. Based on field measurements and an established survey datum, YU will generate a groundwater elevation contour map.

4.3 BEDROCK AND EXISTING MONITORING WELLS SURVEY

All newly installed bedrock monitoring wells and existing on-site monitoring wells will be surveyed by a New York State-licensed land surveyor. The survey will include horizontal location coordinates (X, Y) and the vertical elevations (Z) of the following reference points: the top of the well casing (TOC), ground surface at the well location, and the protective well cover (if applicable). Survey data will be collected in accordance with NYSDEC guidance and referenced to the North American Datum of 1983 (NAD83) for horizontal control and the North American Vertical Datum of 1988 (NAVD88) for vertical control.

4.4 GROUNDWATER SAMPLING

The bedrock monitoring wells, and existing on-site monitoring wells will be purged and sampled in accordance with EPA's low-flow sampling procedures using a submersible or peristaltic pump. The purge water will be monitored for turbidity and water quality indicators [i.e., pH, dissolved oxygen, oxidation-reduction potential (ORP), temperature, and specific conductivity] with measurements collected approximately every five minutes. Stabilization will be considered achieved when three consecutive readings meet the following low-flow sampling criteria: ±0.1 pH units, ±0.2°C temperature, ±3% specific conductivity, ±10% for DO, and ±10 mV for ORP. Turbidity will also be monitored and must be less than 5 NTU prior to sampling. Purged water will be places in 55-gallon drums. The drums will be disposed at a permitted facility after receiving sample results. Groundwater samples will be collected in laboratory supplied pre-cleaned sampling containers, placed in storage/transportation coolers, preserved with ice, and shipped under proper chain of custody procedures to a certified laboratory.

Groundwater stabilization parameters will be interpreted to determine when to collect from permanent monitoring wells. Groundwater stabilization parameters will be screened with the use of a Horiba U-22 Water Quality Monitoring System with a flow-through cell. These forms include purge logs which will provide details on the groundwater conditions prior to sampling.

5.0 FIELD EQUIPMENT CALIBRATION AND MAINTENANCE

The following field instruments will be used during the SRI:

- Photo-ionization detector (PID)
- Horiba U-22 Water Quality Monitoring System (pH, specific conductivity, dissolved oxygen, oxidation reduction, turbidity, and temperature meter)

5.1 PORTABLE PHOTO-IONIZATION DETECTOR (PID)

- The photo-ionization detector will be equipped with either a 10.2 or 10.6 eV lamp. In this configuration, the PID is capable of ionizing and detecting compounds that account for over 70% of the VOCs on the USEPA Target Compound List.

- Calibration must be performed at the beginning of each day of use with a standard calibration gas having a concentration of 100 parts per million of isobutylene. If the unit experiences abnormal perturbation or erratic readings, more frequent or additional calibration will be required.
- All calibration data must be recorded in the project field notebooks.
- A battery check must be completed at the beginning and end of each working day.
- All changes to the PID will be noted in the field notes (such as lamp or filter cleaning or replacement or change of instrument).

5.2 HORIBA U-22 WATER QUALITY MONITORING SYSTEM

5.2.1 pH

The pH will be calibrated each morning prior to initial use, using two standards bracketing the range of interest (generally 4.0 and 7.0). If the pH QC control sample (a pH buffer, which may be the same or different than those used to initially calibrate the instrument) exceeds $\pm$ 0.1 pH units from the true value, the source of the error will be determined and the instrument recalibrated. If a continuing calibration check with pH 7.0 buffer is off by $\pm$ 0.1 pH units, the instrument will be recalibrated. Expired buffer solutions will not be used.

5.2.2 Specific Conductivity

A vendor-provided conductivity standard will be used to check the calibration of the conductivity meter each morning prior to initial use. Specific conductivity will be calibrated using a standard of 4.49 mS/cm in accordance with manufacturer's recommendations. The Specific conductivity QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar).

5.2.3 Turbidity

The turbidity meter will be calibrated using a standard of 0.0 nephelometric turbidity units (NTU). The turbidity meter will be calibrated and checked prior to initial use. The turbidity QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar).

5.2.4 Temperature/Dissolved Oxygen

Temperature and Dissolved Oxygen probes associated with the Horiba U-22 are not subject to field calibration, but the calibration should be checked to monitor instrument performance. The Horiba U-22 will be calibrated by the vendor prior to delivery based on the manufacturer's recommendations. The instrument manual will be referenced for corrective actions if accurate readings cannot be obtained and/or, if necessary, replaced with a recently calibrated instrument.

5.2.5 Oxygen Reduction Potential

The oxygen reduction potential (ORP) meter will be calibrated using a calibration standard of 240 mV. The ORP meter will be calibrated and checked prior to initial use. The ORP QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar).

6.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

6.1 CHAIN-OF-CUSTODY

- A Chain-of-Custody (COC) record will accompany the sample containers during selection and preparation at the laboratory, during shipment to the field, and during return shipment to the laboratory.
- The COC will include the sample identities of each sample container and the analytical parameters for each, and will list the field personnel that collected the samples, preservation method, the project name and number, the name of the analytical laboratory that will receive the samples, and the method of sample shipment.
- If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample shipment.
- The COC will be completed by field personnel as samples are collected.
- Erroneous markings will be crossed-out with a single line and initialed by the author.
- The REMARKS space will be used to indicate if the sample is a matrix spike, matrix spike duplicate, or matrix duplicate.
- Trip and field blanks will be listed on separate rows.
- Field duplicates will be given fictitious sample IDs (e.g., by adding 50 to the sample ID of the original sample) and be submitted blind to the laboratory.
- After the samples have been collected and sample information has been listed on the COC form, the method of shipment, the shipping cooler identification number(s), and the shipper airbill number will be entered on the COC.
- A member of the sampling team will write his/her signature, the date, and time on the first RELINQUISHED BY space.
- One copy of the COC will be retained by sampling personnel. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler.
- Sample shipments will be refrigerated at 4°C, typically by packing with bagged ice, to preserve the samples during shipment.
- After the shipping cooler is closed, custody seals provided by the laboratory will be affixed to the latch and across the front and back of the cooler lid, and signed by the person relinquishing the samples to the shipper.
- The seal will be covered with clear tape, and the cooler lid will be secured by wrapping with packing tape.
- The cooler will be relinquished to the shipper, typically an overnight carrier.
- The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the samples will not be analyzed until directed to do so.
- The samples must be delivered to the laboratory within 48 hours of collection.

7.0 SAMPLE IDENTIFICATION, NUMBERING, AND LABELING

Soil and groundwater sample containers will be labeled at the time of sampling with the following information:

- Project name and number
- Sample location ID
- Sample number
- Sample depth
- Date and time of collection
- Sampler initials
- Analysis required

For example,

Field duplicates will have the same number as the original sample, with 50 added to the sample location ID. For example, the field duplicate of B-01 will be labeled as B-51.

Trip blanks will be identified as "TB" followed by a six-digit date code indicating the date of shipment. For example, the trip blank shipped on November 15, 2023 will be labeled TB111523.

Field (equipment rinsate) blanks will be identified as "Field Blank" followed by a matrix code. For example, the field blank for soil will be labeled as Field Blank Soil.

Matrix spikes and matrix spike duplicates will have the same number as the duplicates followed by MS and MSD, respectively. For example, the matrix spike for B-01 will be labeled as B-51 MS.

Pre-printed sample labels will be provided by the laboratory along with the sample containers. Sample labels will be completed and as described above. At a minimum, they will include the site name or number, sample ID, date of sample, and the analysis required.

8.0 EQUIPMENT DECONTAMINATION AND DERIVED WASTE DISPOSAL

A temporary decontamination area lined with polyethylene sheeting will be prepared on site for use during decontamination of the drilling and test pitting equipment. Water collected from the decontamination of activities will be collected in 55-gallon drums or a bulk tank. Decontamination fluid will be discharged directly to the ground away from any surface water. As a contingency, the boring contractor will have drums available for containerization.

All drilling equipment including the backhoe, bucket, and drilling rig; augers; rods; tools; split spoon samplers; and tremie pipes will be cleaned with a high-pressure, water pressure washing unit between investigation locations. Tools, drill rods, and augers will be placed on polyethylene plastic sheets following pressure washing. Direct contact with the ground will be avoided. The back of the drill rig and all tools, augers, and rods will be decontaminated at the completion of the work and prior to leaving the site.

All non-dedicated hand equipment and tools will be decontaminated using the following procedures:

- Scrub/wash with a laboratory grade detergent (e.g., Alconox);
- Tap water rinse or distilled/de-ionized water rinse; and
- Distilled/de-ionized water rinse.

If equipment is to be stored for future use, it will be allowed to air dry, and then wrapped in aluminum foil or sealed in plastic bags.

General trash generated during the investigation (e.g., packaging materials, personal protective equipment which is not grossly contaminated) will be bagged and disposed as ordinary solid waste.

9.0 FIELD DOCUMENTATION

Field notebooks will be initiated at the start of on-site work. The field notebook will include the following daily information for all site activities (except that information that is recorded on standard forms need not be repeated in the log book):

- Date;
- Meteorological conditions (temperature, wind, precipitation);
- Site conditions (e.g., dry, damp, dusty, etc.);
- Identification of crew members (YU and subcontractor present) and other personnel (e.g., agency or site owner) present;
- Description of field activities;
- Location(s) where work is performed;
- Problems encountered and corrective actions taken;
- Records of field measurements or descriptions recorded; and
- Notice of modifications to the scope of work.

During sampling of wells, field samplers will add the following:

- Sampling point locations and test results such as pH, conductance, etc.;
- Information about sample collection (e.g., duplicate sample location);
- Chain of custody information; and
- Field equipment calibration.

Field Forms will be used to standardize data collection and documentation, including the following:

- Well construction logs will be provided for permanent monitoring wells;
- Purge logs will be provided for groundwater sample collection;
- A photo log will be developed that documents site conditions, sampling procedures, and problems encountered. **Sss**

APPENDIX C - QAPP

APPENDIX C

Quality Assurance Project Plan

11-35 31st Drive

Block 503, Lot 41

Site ID: C241215

Submitted to:

New York State Department of Environmental Conservation

Division of Environmental Remediation

Remedial Bureau B, 12th Floor

625 Broadway

Albany, NY 12233-7016

Prepared for:

Astoria Riverside Park, LLC

280 N. Central Ave. Ste. 110

Hartsdale, New York 10530

Prepared by:

YU & Associates Engineers, P.C.

611 River Drive, 3rd Floor

Elmwood Park, NJ 07407

July 31, 2025

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1.0 INTRODUCTION

The purpose of this Quality Assurance Project Plan (QAPP) is to document planned supplemental remedial investigation (SRI) activities and establish the criteria for performing these activities at a pre-determined quality at the 11-35 31st Drive, Astoria, New York. The QAPP describes the proposed sampling and analytical methods for the SRI activities to determine and characterize the extent of contamination in bedrock groundwater and fractures.

The work will be performed in accordance with New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation DER-10 Technical Guidance for Remedial Investigation and Remediation (May 2010).

1.1 SITE DESCRIPTION

The Site is located in the County of Queens, New York City, New York and is identified as Block 503 and Lot 41 on the New York City Tax Map. The Site is situated on an approximately 0.23-acre area at 11-35 31st Drive. The Site is bound by a multi-story residential apartment building with a two-story parking garage to the north; 31st Drive and residential and light industrial buildings to the south; an asphalt paved parking lot and multi-family residential apartment buildings to the east, and an outdoor recreation area to the west. The subject Site was initially developed as early as 1898 and utilized as a residence through at least the 1950s. The original warehouse building was constructed circa 1959 after which the Site was utilized as a commercial facility. A steel works had occupied the Site from 1967 to 2010. After which, two commercial transportation companies occupied the Site in 2014. The site is currently vacant.

Based upon the remedial investigation results, surface and sub-surface soils above groundwater level were contaminated with VOCs, SVOCs, PCBs, pesticides and metals throughout the Site. The source of VOCs, especially PCE concentrations detected in soil throughout the Site at concentrations exceeding the Residential Use SCOs are likely attributable to the previous on-site operations. A spider map showing the CVOCs exceedances in soils above groundwater level is included in the supplemental remedial investigation work plan (SRIWP).

The deep saturated soils below groundwater level were heavily contaminated with PCE in the vicinity of the former dipping tanks area, where the dense non aqueous phase liquid (DNAPL) was present. The source of PCE DNAPL is likely attributable to the previous on-site operations. A spider map showing the CVOCs exceedances in saturated soils below the groundwater level is included in the SRIWP

Groundwater sample results indicate VOCs (especially CVOCs), SVOCs (PAHs), PCBs (Aroclor-1254), and metals (iron, magnesium, manganese, sodium, and lead) contamination above Class GA groundwater criteria. The source of VOCs is likely attributable to the previous on-site operations. The source of SVOCs, PCB and PAHs detected in groundwater could be attributed to the on-site soil and fill material.

CVOCs in soil vapor were detected on-site at concentrations exceeding NYSDOH Air Guideline Values. The elevated CVOCs levels in soil vapor are consistent with the soil and groundwater CVOCs contamination.

1.2 PROJECT SCOPE OF WORK

General field activities include mobilization, implementation of the site-specific health and safety plan (HASP), a geophysical survey, sampling activities, utility clearance procedures, decontamination procedures, and handling of investigation derived waste. Groundwater sampling activities include bedrock monitoring well installation and well survey, well development, and groundwater sample collection.

2.0 PROJECT ORGANIZATION

- Project Manager: Sixuan Wang — Phone: (201) 791-0075, Mobile: (201) 988-3935
- Quality Assurance Officer: Chengyu Hang — Phone: (201) 791-0075, Mobile: (201) 873-7543
- Field Team Leader: David Huang — Phone: (201) 791-0075, Mobile: (917) 860-9478

3.0 GENERAL QAPP PROCEDURES

In order to ensure proper sampling and analysis protocols, as well as quality assurance/quality control (QA/QC) procedures for data collection and data analysis activities at the Site, YU will follow the sampling, sample handling and storage, and sample equipment decontamination procedures specified by YU's SRIWP. Equipment functionality, chain-of-custody, and other relevant notes will be recorded in the field. Data validation activities will include the manual check of laboratory data tables and reduced data summary tables. Conclusions and/or recommendations will be reviewed by one or more qualified peers of the professional who developed them to verify their accuracy on the basis of acquired data and conducted analyses.

4.0 QUALITY MANAGEMENT SYSTEM

4.1 GENERAL REQUIREMENTS

YU has established, documented, implemented, maintained and is continually improving its Quality Management System (QMS) in accordance with the requirements of the ISO 9001-2008 standard. In order to implement the QMS, YU has developed the following matrix that identifies:

- The processes needed for the QMS;
- The sequence and interaction of these processes;
- The criteria and methods to ensure effective operation and control of the processes; and
- The availability of information necessary to support the effective operation and monitoring of these processes.

QUALITY PROCESS	OBJECTIVES	RISKS TO ACHIEVE OBJECTIVES	CONTROLS	INTERNAL MEASUREMENT
Design Concepts	Understand requirements of the Project / customer / Agencies	Inexperienced personnel and/or inadequate preparation. Failure to understand requirements.	Review by experienced professional.	Did you meet your project requirements?
Preparation	Prepare for Fieldwork	Subconsultant agreements not in place. Inexperienced personnel and/or inadequate preparation. Permits not obtained.	Process checklist. Customer-related processes.	Did you meet the schedule? Were scope and design criteria clearly defined?

QUALITY PROCESS	OBJECTIVES	RISKS TO ACHIEVE OBJECTIVES	CONTROLS	INTERNAL MEASUREMENT
Preliminary Design	Progress SRIWP to appropriate level for review	Poor customer information. Inexperienced personnel. Failure to understand requirements. Insufficient staff.	Reference to DER-10. Timely review of progress well ahead of deadline.	Did you meet the requirements in the Contract for technical content and transmit for customer review on time?
Data Collection	Obtain all necessary data	Failure to collect important data prior to and during the fieldwork process.	Checklists and SRIWP. Review by experienced professional. Reference to DER-10 and/or CP-51.	Was all necessary data collected? Does project team have adequate information to make sound judgment of existing conditions? Was the proper investigation approach selected? Were samples collected and analyzed properly? Were all in scope media (soil and groundwater) assessed? Were supplemental assessment tools needed and/or used?
Reporting	Document fieldwork and findings	Inexperienced personnel. Failure to clearly explain activities. Improper analysis. Flawed findings.	Review by experienced professional.	Does the report clearly describe the objectives of the project, the steps taken to achieve the objectives, the analyses performed, and the findings? Does the report meet NYSDEC standards for remedial action? Was the data compared to the correct screening levels?

YU will verify that quality process objectives are met and any deviations from the guidelines or procedures will be documented. Recommendations to improve the process and/or work product(s) from staff or clients will be reviewed by YU's management and addressed, as needed.

4.2 OBJECTIVES

The data quality objectives are to generate usable and valid data. Sampling will be performed to gather the necessary data to adequately assess the condition of hazardous materials on Site. Field protocols for sample collection will follow relevant standards as described in YU's SRIWP. Relevant health and safety field screening will be performed and documented in accordance with YU's Health and Safety Plan.

Samples sent to the analytical laboratory will be analyzed for parameters consistent with the project scope of work defined in the SRIWP. Analyses will be performed in accordance with the most current USEPA Methods or other recognized methods specified in the SRIWP. Satisfactory completion and compliance with the data quality objectives will be assured by performing analyses in accordance with the stated methods and by requesting QA/QC procedures and deliverables to be sufficiently comprehensive that a data validation assessment will be performed. Analytical data will be requested in electronic format.

5.0 SAMPLE HANDLING

5.1 SAMPLING PRECEDURES

Soil and groundwater samples will be collected to assess potential contamination in the bedrock and overburden. Soil samples will be obtained during borehole advancement, screened in the field, and analyzed for TCL VOCs. Groundwater samples will be collected from newly installed and existing wells using low-flow sampling techniques. All groundwater samples will be analyzed for a full suite of contaminants, following NYSDEC and EPA-approved methods, and handled in accordance with proper QA/QC and chain of custody procedures.

5.1.1 Soil Sampling

A total of five proposed bedrock wells (MW-15BR through MW-19BR) will be installed at the locations shown in Figure 2 of SRIWP. The rationale for the proposed groundwater sample locations is summarized in Table 1 of SRIWP.

During borehole advancement, continuous soil sampling will be performed using 2-foot split-spoons or shelby tubes. The soils will be screened with photoionization detector (PID) and logged in the field by a YU field engineer, and one soil sample will be collected from the most impacted interval based on (PID) screening and field observations from each boring. The soil sample will be analyzed for TCL VOCs only.

5.1.2 Groundwater Sampling

Groundwater samples will be collected from the five bedrock wells and existing on-site monitoring wells. The monitoring wells will be purged and sampled in accordance with EPA's low-flow sampling procedures using a submersible or peristaltic pump. The purge water will be monitored for turbidity and water quality indicators [i.e., pH, dissolved oxygen, oxidation-reduction potential (ORP), temperature, and specific conductivity] with measurements collected approximately every five minutes. The criteria for stabilization will be three successive readings within ±10% for pH, temperature, and specific conductivity. Purged water will be placed in 55-gallon drums. The drums will be disposed at a permitted facility after receiving sample results.

All groundwater samples will be collected and analyzed for TCL VOCs by EPA Method 8260C, Semi-volatile Organic Compound (SVOCs) by EPA Method 8270D, pesticides by EPA Method 8081B, polychlorinated biphenyls (PCBs) by EPA Method 8082A, total metals by EPA Method 6010D, mercury by EPA Method

7473, PFAS (NYSDEC Analyte List) by EPA Method 1633; and 1,4-dioxane via EPA Method 8270D. The sample quantities, analytical methods, and QA/QC samples required are summarized in Table 1of SRIWP. Each sample container will be properly preserved, labeled, and placed in an ice-filled cooler for delivery via courier under standard COC procedures to a NYSDOH ELAP-certified laboratory for analysis with Category B deliverables.

5.2 SAMPLING IDENTIFICATION/LABELING

Soil and groundwater sample containers will be labeled at the time of sampling with the following information:

- Project name and number
- Sample location ID
- Sample number
- Sample depth
- Date and time of collection
- Sampler initials
- Analysis required

For example,

Field duplicates will have the same number as the original sample, with 50 added to the sample location ID. For example, the field duplicate of B-01 will be labeled as B-51.

Trip blanks will be identified as "TB" followed by a six-digit date code indicating the date of shipment. For example, the trip blank shipped on November 15, 2023 will be labeled TB111523.

Field (equipment rinsate) blanks will be identified as "Field Blank" followed by a matrix code. For example, the field blank for soil will be labeled as Field Blank Soil.

Matrix spikes and matrix spike duplicates will have the same number as the duplicates followed by MS and MSD, respectively. For example, the matrix spike for B-01 will be labeled as B-51 MS.

Pre-printed sample labels will be provided by the laboratory along with the sample containers. Sample labels will be completed and as described above. At a minimum, they will include the site name or number, sample ID, date of sample, and the analysis required.

5.3 SAMPLING PRESERVATION AND HOLDING TIME

Sample container, preservation, and holding time requirements are summarized as below.

5.3.1 Sample Preservation

Groundwater samples submitted for VOC analysis will be preserved to a pH of ≤ 2 with hydrochloric acid (HCl). Groundwater samples submitted for metals analysis will be preserved to a pH of ≤ 2 with nitric acid (HNO3). The laboratory will provide pre-preserved 40-mL VOA vials and 1-L poly containers for the respective analysis. The samples will be collected in the laboratory supplied pre-cleaned sampling containers, placed in storage/transportation coolers, preserved with ice, and shipped under proper chain of custody procedures to a certified laboratory.

5.3.2 Holding Time

Holding times are judged from the verified time of sample receipt (VTSR) by the laboratory. Laboratory will pick up soil and groundwater samples the morning after collection (e.g, Monday's samples will be picked up on Tuesday morning for laboratory delivery). Samples collected on Friday will be hand delivered to the laboratory by YU staff. For the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered.

5.4 CHAIN-OF-CUSTODY AND SHIPPING

A Chain-of-Custody form will trace the path of sample containers from the Site to the laboratory. Sample/bottle tracking sheets or the Chain-of-Custody will be used to document the custody of the samples within the laboratory from sample receipt though completion of analysis. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples and the anticipated date of arrival. Sample shipping containers (e.g., coolers) will be provided by the laboratory for shipping samples. All sample containers within each shipment will be individually labeled with an adhesive identification label provided by the laboratory. In

addition, each sample shipping container will be sealed with two adhesive custody seals. The custody seals will be initialed by a member of the field sampling team.

6.0 DECONTAMINATION

Decontamination procedures are intended to prevent the cross-contamination of environmental samples, and minimize the exposure to individuals involved in sampling and communities living near the Site. Deionized water will be utilized for decontamination purposes and the decontamination water will be handled as investigative derived waste (IDW) and containerized in an open-top 55-gallon steel drum, properly labeled and sealed. All non-dedicated equipment and tools used to collect samples will be decontaminated prior to sampling, and between each sample interval, and prior to leaving the site using an Alconox rinse and deionized water rinse prior to reuse. Any excess sample soil will be included as IDW and containerized in a separate open-top 55-gallon steel drum, properly labeled and sealed. Used personal protective equipment (PPE) will be decontaminated to the extent possible and disposed of in the 55-gallon drum. Field equipment rinsate blanks will be generated and analyzed to monitor the effectiveness of field decontamination procedures.

7.0 DATA QUALITY REQUIREMENTS

Analytical methods and data quality requirements are discussed below. All sample containers and sample analyses will be provided by a NYSDOH ELAP-certified laboratory.

7.1 ANALYTICAL METHODS

The samples collected during remedial actions will be subject to analytical testing methodologies that follow United State Environmental Protection Agency (USEPA) SW-846 methods with an equivalent Category B deliverables package and third party data validation.

Soil samples will be analyzed using the following analytical methods:

- TCL VOCs by EPA Method 8260C

Groundwater samples will be analyzed using the following analytical methods:

- TCL VOCs by EPA Method 8260C
- SVOCs by EPA Method 8270D
- Pesticides by EPA Method 8081B
- PCBs by EPA Method 8082A
- Total Metals by EPA Method 6020B
- Mercury by EPA Method 7473
- PFAS (NYSDEC Analyte List) by EPA Method 1633; and
- 1,4-dioxane via EPA Method 8270D.

7.2 QUALITY ASSURANCE OBJECTIVES

Data quality objectives (DQOs) for measurement data in terms of sensitivity and parameters including precision, accuracy, representativeness, comparability, and completeness (PARCC) are established so that the data collected are sufficient and of adequate quality for their intended use. Data collected and analyzed in conformance with the DQO process described in this QAPP will be used in assessing the uncertainty associated with decisions related to this Site.

7.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is easier to control and quantify than sampling precision; there are more historical data related to individual method performance and the "universe" is not limited to the samples received in the laboratory. In contrast, sampling precision is unique to each site or project. Overall system (sampling plus analytical) precision will be determined by analysis of field duplicate samples. Analytical results from laboratory duplicate samples will provide data on measurement (analytical) precision.

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Field duplicates will be collected at a frequency of one per 20 environmental samples of each type. Relative Percent Difference (RPD) criteria are used to evaluate precision between duplicates, using the equation below:

$$RPD = 100 \times [2(X_1 - X_2) / (X_1 + X_2)]$$

where:

X_1 and X_2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Criteria for evaluation of laboratory duplicates are specified in the applicable methods. The objective for field duplicate precision is $\leq$ 50% RPD for all matrices. Precision is not calculable where the analyte is not detected in one or both of the sample and duplicate. The absolute difference between the results ($X_1 - X_2$) may be a more appropriate measure of analytical precision where the reported concentrations are low (i.e., less than five times the RL).

7.2.2 Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent Recovery Criteria, published by the NYSDEC as part of the ASP, and those determined from laboratory performance data are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike will be performed once for every sample delivery group (SDG) as specified in the ASP-CLP. Other method-specific laboratory QC samples (such as

laboratory control samples and continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

%R = (SSR-SR)/SA x 100,

where:

SSR = Spiked Sample Result

SR = Sample Result, and

SA = Spike Added

7.2.3 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions. Representativeness is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

7.2.4 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), USEPA, or the New York State Department of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and,
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance. Comparability is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

7.2.5 Completeness

The goal of completeness is to generate the maximum amount possible of valid data. The highest degree of completeness would be to find all deliverables flawless, valid, and acceptable. The lowest level of completeness is excessive failure to meet established acceptance criteria and consequent rejection of data. The completeness goal is 95 percent useable data. However, it is acknowledged that this goal may not be fully achievable; for example, individual analytes may be rejected within an otherwise acceptable analysis; or some sampling locations may not be accessible. The impact of rejected or unusable data will be determined on a case-by-case basis. If the study can be completed without the missing datum or data, no further action would be necessary. However, loss of critical data may require re-sampling or reanalysis.

7.2.6 Sensitivity

Sensitivity criteria are established so that reporting limits are adequate to verify the absence of a non-detected analyte at the applicable threshold concentration (e.g., regulatory limits or guidance values). Laboratory reporting limits will be reviewed prior to sample collection to verify that limits are appropriate for the specific analytes and matrices.

7.3 FIELD QUALITY ASSURANCE

Field quality assurance/quality control samples associated with the generation of environmental data typically include field (equipment rinsate) blanks; field duplicates; and trip blanks. The rationale and frequency of each of these are discussed below.

7.3.1 Field (Equipment Rinsate) Blanks

Field blanks are not required when laboratory-decontaminated, dedicated sampling equipment is used. One equipment blank will be collected each week for the sampling equipment used to collect groundwater samples in order to verify that it has not become contaminated through shipment and storage. Field blanks will be collected once per each group of 20 (or fewer) samples for soil sample collection.

7.3.2 Field Duplicate Samples

Duplicates will be collected at a frequency of one per 20 samples of each type, and will be analyzed for the same parameters as the environmental sample. Duplicate groundwater samples will be collected by alternately filling laboratory-provided VOC vials and pre-preserved bottles for metals. Soil sample duplicates for VOC analysis will be co-located grab samples; samples for VOC analysis will not be mixed to avoid loss of volatile constituents.

7.3.3 Trip Blanks

The purpose of a trip blank is to place a mechanism of control on sample container preparation, quality, and sample handling. The trip blank travels from the lab to the Site with the empty sample container and back from the Site with the collected samples. One trip blank will be submitted with each sample shipment of water samples and analyzed for VOCs.

7.4 LABORATORY QUALITY ASSURANCE

Method-required laboratory quality assurance includes an instrument performance check; calibration check; and method blank analysis for each group of 20 or fewer samples. In addition, internal standards are added to every sample (environmental samples and laboratory QA/QC samples).

Laboratories typically perform additional QC, such as spikes, laboratory duplicates, and laboratory control samples. The frequency of these analyses is specified in the laboratory's analytical standard operating procedure (SOP) for the method.

7.4.1 Instrument Performance Check

The instrument performance check verifies the operation of the gas chromatography/mass spectrometry (GC/MS) and verifies that it meets tuning and mass spectral abundance criteria prior to sample data acquisition.

7.4.2 Calibration Checks

An initial five-point calibration check must be performed after the instrument performance check but prior to the analysis of blanks and samples. Concentrations of the calibration standards should be selected to span the concentration range of interest. One of the concentrations of the initial calibration must be the same as the daily calibration check.

On a daily basis, a single-point calibration check must be analyzed (with each group of 20 or fewer samples). The percent difference (%D) for each compound in the daily calibration check should be within ±30 percent of the response determined in the initial calibration in order to proceed with sample analysis. If the %D criteria are not met, a new five-point calibration should be performed.

7.4.3 Method Blanks

Method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instrument as the sample is prepared and analyzed in the laboratory.

The method blank should not contain any target analytic at a concentration greater than its quantitation level (reporting limit; typically, three times the MDL) or its action level, whichever is more stringent. Method blanks are analyzed at a frequency of one for every 20 samples analyzed, or every analytical batch, whichever is more frequent.

7.4.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Site-specific MS/MSD samples will be submitted during sampling at a rate of one per 20 samples.

7.4.5 Internal Standards

Internal standards (IS) are added to every sample analyzed for VOCs (in either matrix) and SVOCs. Sample-specific IS recovery should be ±40 percent of the mean response in the most recent valid calibration.

8.0 SUBCONTRACTOR & QA OVERSIGHT

8.1 PURCHASING PROCESS

Where sub-consultants/Subcontractors are engaged to work on projects, their capability to perform the assigned scope of services shall be evaluated by the Project Manager (PM). The PM is responsible for follow-up on identified areas of poor performance. Records of performance for the various sub-consultants/Subcontractors will be maintained by the PM. Sub-consultants with a record of poor performance will be excluded from future consideration.

8.2 PURCHASING INFORMATION

Purchase Orders and Contracts with sub-consultants/Subcontractors will define product requirements, QMS requirements, applicable procedures, processes, equipment, and personnel qualifications in sufficient detail to ensure the work performed meets the purchase order requirements. The Contract/Agreement between YU and respective sub-consultants/Subcontractors will define the above requirements in sufficient detail to verify the work performed meets the purchase order requirements.

On this Project, the sub-consultants/Subcontractors will be performing work under their own Quality Plan which shall be reviewed and approved by YU. The PM, or his designee, will perform an evaluation of the sub-consultants/Subcontractors implementation of their Quality Plan on a periodic basis as appropriate to the activities of the sub-consultants/Subcontractors. Reports of this evaluation will be maintained by the PM for the duration of the project. Any noncompliance shall be resolved to the satisfaction of the Client, and records maintained.

Verification of Purchased Product Work prepared by the sub-consultants/Subcontractors will be reviewed for conformance to Agreement/Contract requirements, accepted by the PM, and documented by written notification that the sub-consultants/Subcontractors work is in conformance with Contract requirements.

8.3 SUBCONTRACTORS/SUB-CONSULTANTS ANTICIPATED FOR THE REMEDIAL ACTION

It is anticipated that sub-consultants or subcontractors may be engaged by YU for the following services in the performance of the work covered by this SRIWP:

- One-Call utility mark-out,

- Geophysical survey,
- Perimeter air quality monitoring for VOCs and particulates for the duration of field activities that would produce organic vapors or airborne particulates, in the interest of ensuring ambient and work space air quality and providing for on-site personnel and public safety,
- The collection of soil samples,
- Borehole geophysical survey,
- The completion of permanent monitoring wells installation,
- The bedrock monitoring wells installation and development,
- Well survey,
- The collection of groundwater sample via permanent monitoring wells,
- Investigation derived waste (IDW) disposal, surveying, and other activities auxiliary to permanent well installation, sampling and development.

9.0

9.0 QUALITY MANAGEMENT

A senior YU employee will serve as the Quality Assurance Officer for the project. This individual will not have direct project responsibility but will independently monitor the implementation of YU's QMS. The duties of the Quality Assurance Officer will be:

- Monitor the project in accordance with YU's QMS.
- Review the project to ensure that goals of the project are adequately addressed.
- Record any deviation from the QMS pertaining to any aspect of the project and ensure the PM is aware of said deviation.
- Meet with the PM on an as needed basis to discuss adherence to the QMS.
- Advise the PM of findings and make recommendations on methods to improve quality.
- Coordinate activities with other sub-consultants/Subcontractors and Client.
- Verify that outside services from sub-consultants/Subcontractors meet with plan and contract requirements.

10.0 DATA REDUCTION, VALIDATION, AND REPORTING

Data validation activities will include the manual check of laboratory data tables and reduced data summary tables. A cycle of markup, revision, and trace checking shall be performed and a check by the PM will ensure data quality.

Conclusions and/or recommendations will be reviewed by one or more qualified peers of the professional who developed them to ensure their accuracy on the basis of acquired data and conducted analyses.

The guidance followed to perform quality data validation, and the methods and procedures outlined herein and elsewhere in the SRIWP, pertain to initiating and performing data validation, as well as reviewing data validation performed by others (if applicable). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

10.1 LABORATORY DATA REPORTING AND REDUCTION

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the NYSDEC ASP Category B deliverable requirements. In addition to the hard copy of the data report, the laboratory will be asked to provide the sample data electronically in spreadsheet form, generated to the extent possible directly from the laboratory's electronic files or information management system to minimize possible transcription errors resulting from the manual transcription of data. The laboratory will also provide the electronic deliverable in NYSDEC "EZ-EDD" format, as described in ASP 2005 Exhibit H, Section 1.1.1.

10.2 DATA VALIDATION

A subcontractor to YU will review and validate the soil and groundwater data. The data validator will be independent of the laboratory and independent of YU. Data validation will be performed by following guidelines established in the specific USEPA Region 2 SOPs.

Validation reports will consist of text results of the review and marked up copies of Form I (results with qualifiers applied by the validator). Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be

documented in the report text. The results of the data validation will be presented in a Data Usability Summary Report (DUSR) prepared by the validation subcontractor.

10.3 DATA USABILITY

Subsequent to review of the items evaluated in the subcontractor's DUSR and accompanying tables, YU will then prepare a brief data usability summary. The data usability summary, which will be provided as part of the Final Engineering Report (FER), encompasses both quantitative and qualitative aspects, although the qualitative element is the most significant.

The quantitative aspect is a summary of the data quality as expressed by qualifiers applied to the data; the percent rejected, qualified (i.e., estimated), missing, and fully acceptable data are reported. As appropriate, this quantitative summary is broken down by matrix, laboratory, or analytical fraction or method. The qualitative element of the data usability summary is the QA officer's translation and summary of the validation reports into a discussion useful to data users. The qualitative aspect will discuss the significance of the qualifications applied to the data, especially in terms of those most relevant to the intended use of the data. The usability report will also indicate whether there is a suspected bias (high or low) in qualified data, and will also provide a subjective overall assessment of the data quality.

10.4 FIELD DATA

Field data collected during the field activity will be presented in tabular form with any necessary supporting text. Unless activities resulted in significant unexpected results, field data comments can be added as footnotes to the tables.

11.0 TRAINING

YU will:

- Identify competency needs for personnel performing activities affecting quality. YU has developed position descriptions for those personnel performing activities affecting quality, which identify competency requirements. The PM maintains the latest issue of such position descriptions.
- Provide training to satisfy competency needs. The PM is responsible for identifying training needs and assuring that training is performed.
- Only employ qualified personnel to execute the scope of work.

The PM is responsible for verifying that each employee assigned to the project has read and understands the QMS, and is familiar with the procedures/instructions unique to the project. Training will consist of in-house technical and non-technical seminars given by qualified and experienced senior staff members. In addition, specifically conducted meetings will be designed to review quality of work and address any corrective measures needed to correct any nonconformance discovered. Project specific staff will be required to attend. The PM will maintain training and other records of proficiency at YU's office located on the 3rd floor of 611 River Drive, Elmwood Park, NJ 07407.

12.0 GLOSSARY

1. "Alteration" means altering a sample collected for analysis in any way other than by adding a preservative, such as nitric acid to lower pH. Examples of alteration include, but are not limited to: filtering, settling and decanting, centrifuging and decanting and acid extracting.

2. “Analytical Services Protocol” or "ASP" means DEC’s compilation of approved EPA laboratory methods for sample preparation, analysis and data handling procedures.

3. “Correlation sample” means a sample taken, when using a field-testing technology, to be analyzed by an ELAP-certified laboratory to determine the correlation between the laboratory and field analytical results.

4. "Effective solubility" means the theoretical aqueous solubility of an organic constituent in groundwater that is in chemical equilibrium with a separate-phase (NAPL) mixed product (product containing several organic chemicals). The effective solubility of a particular organic chemical can be estimated by multiplying its mole fraction in the product mixture by its pure-phase solubility.

5. “Environmental Laboratory Accreditation Program” or “ELAP” means a program conducted by the NYSDOH which certifies environmental laboratories through on-site inspections and evaluation of principles of credentials and proficiency testing. Information regarding ELAP is available at the NYSDOH Wadsworth Laboratory website.

6. "Filtration" means the filtering of a groundwater or surface water sample, collected for metals analysis, at the time of collection and prior to preservation. Filtering includes but is not limited to the use of any membrane, fabric, paper or other filter medium, irrespective of pore size, to remove particulates from suspension.

7. “Final delineation sample” means a sample taken to make a decision regarding the extent of contamination at a site during the investigation and the design of the remedy or confirmation/documentation sampling during remedial construction, which is to be analyzed by an ELAP-certified laboratory.

8. “Intermediate sample” means a sample taken during the investigation or remediation process that will be followed by another sampling event to confirm that remediation was successful or to confirm that the extent of contamination has been defined to below a level of concern.

9. "Method detection limit" or "MDL" means the minimum concentration of a substance that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.

10. “Minimum reporting limit” means the lowest concentration at which an analyte can be detected and which can be reported with a reasonable degree of accuracy. It is the lowest concentration that can be measured, a lab-specific number, developed from minimum detection limits, and is also referred to as the practical quantitation limit (PQL).

11. “Nephelometric Turbidity Unit” or "NTU" is the unit by which turbidity in a sample is measured.

12. "Preservation" means preventing the degradation of a sample due to precipitation, biological action, or other physical/chemical processes between the time of sample collection and analysis. The most common examples involve refrigeration at 4 degrees Celsius and lowering sample pH by the addition of acid to keep dissolved metals in solution or to reduce the biodegradation of dissolved organic analytes.

13. "Target analyte list" or "TAL" means the list of inorganic compounds/elements designated for analysis as contained in the version of the EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis. “TAL Metals” refers to just the 23 metals, but without analysis for cyanide.

14. "Targeted compound" means a contaminant for which a specific analytical method is designed to detect that potential contaminant both qualitatively and quantitatively.

15. "Target compound list plus 30" or "TCL+30" means the list of organic compounds designated for analysis (TCL) as contained in the version of the EPA Contract Laboratory Program Statement of

Work for Organics Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis, and up to 30 non-targeted organic compounds (plus 30) as detected by gas chromatography/mass spectroscopy (GC/MS) analysis.

16. "Tentatively identified compound or TIC" means a chemical compound that is not on the target compound list but is detected in a sample analyzed by a GC/MS analytical method. TICs are only possible with methods using mass spectrometry as the detection technique. The compound is tentatively identified using a mass spectral instrumental electronic library search and the concentration of the compound estimated.

17. "Well development" means the application of energy to a newly installed well to establish a good hydraulic connection between the well and the surrounding formation. During development, fine-grained formation material that may have infiltrated the sand pack and/or well during installation is removed, allowing water from the formation to enter the well without becoming turbid and unrepresentative of groundwater in the formation.

APPENDIX D - HASP

APPENDIX D

HEALTH AND SAFETY PLAN

Former Kenneth Trading Corp. Facility

11-35 31st Drive, Astoria, NY 11106

BCP# C241215

Block 41, Lot 503

Submitted to:

BROWNFIELD CLEANUP PROGRAM

New York State Department of Environmental Conservation

Division of Environmental Remediation

Remedial Bureau B, 12th Floor

625 Broadway

Albany, New York 12233-7016

Prepared for:

Astoria Riverside Park, LLC

280 N. Central Avenue 60A

Hartsdale, New York 10530 Astoria

Prepared by:

YU & Associates Engineers, P.C.

611 River Drive, 3rd Floor

Elmwood Park, NJ 07407

July 31, 2025

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1.0 APPROVALS

By the signatures the undersigned certify that this HASP is approved and will be utilized during the installation, development, and sampling of monitoring wells at the site of 11-35 31st Drive, Astoria, NY.

Andrew Leung
YU & Associates, Inc. Date: _____
Project Manager

Sixuan Wang
YU & Associates, Inc.
Health and Safety Officer/Site Health and Safety Officer Date: _____

Chengyu Hang
YU & Associates, Inc. Date: _____
Field Team Leader

_____ Date: _____
Property Owner Representative

_____ Date: _____
Client Representative

2.0 GENERAL

This Health and Safety Plan (HASP) has been prepared in conformance with §29 CFR 1910.120 and project requirements. It addresses the minimum requirements for the activities associated with the bedrock monitoring wells installation, sampling of subsurface soils and, groundwater sampling in the proximity of 11-35 31st Drive, Astoria, NY as they relate to activities performed in the presence of Controlled Materials, Resource Conservation and Recovery Act (RCRA) hazardous waste, New York Regulated Waste, Occupational Safety and Health Administration (OSHA) Hazardous Materials, regulated substances or otherwise environmentally sensitive conditions.

This plan will be implemented by **YU & Associates (YU)** through the designated Health and Safety Officer (HSO) during site work. Compliance with this HASP is required of all persons and third parties who perform field work for this project. This HASP is prepared for use by all persons coming into contact with contaminated groundwater, soil, and soil vapor at the site. Other consultants and contractors working on this project should be responsible for the development of their own HASP. Assistance in implementing this HASP can be obtained from the project Health and Safety Officer (HSO) and/or the Project Manager (PM).

The health and safety practices, procedures, and personal protective equipment (PPE) requirements established for this project are based on existing information on the chemical and physical hazards known to be present at this site. The content of this HASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the technical scope of the work. Any changes proposed must be reviewed by the HSO and are subject to approval of the PM. The "HASP Field Change Request Form" provided in Appendix A may be used to initiate such changes.

2.1 SCOPE OF WORK

The field operations that this HASP covers are:

- Mobilization/Demobilization
- One-Call utility mark-out,
- Geophysical survey,
- Perimeter air quality monitoring for VOCs and particulates for the duration of field activities that would produce organic vapors or airborne particulates, in the interest of ensuring ambient and work space air quality and providing for on-site personnel and public safety,
- The collection of soil samples,
- Borehole geophysical survey,
- Existing monitoring well development,
- The completion of permanent monitoring wells installation and development,
- Well survey,
- The collection of groundwater sample via permanent monitoring wells,
- Investigation derived waste (IDW) disposal, surveying, and other activities auxiliary to permanent well installation, sampling and development.

2.2 HASP-RELATED ACTIVITIES

- Develop and implement health and safety plan according to NIOSH and the OSHA standards.
- Medical surveillance for site personnel.
- Provide information, education and training, including HAZWOPER training and certification for site personnel.
- Delineate on-site personnel responsibilities and contact information.
- Monitor air quality with a Photo Ionization Detector (PID) or MultiRAE.

- Conduct on-site investigations and inspections of possible hazards at site.
- Establish a decontamination zone (also known as contamination reduction), as well as support and exclusion zones.
- Ensure proper use of PPE and hazard-measurement instruments.
- Maintain a record of work-related illnesses, injuries and accidents.
- Prepare for emergencies.

2.3 EMERGENCY CONTACTS

Project Management/Health and Safety Personnel		Phone Number
Field Team Leader	David Huang YU & Associates	Office: (201) 791-0075 Mobile: (201) 873-7543
Health and Safety Officer	Chengyu Hang YU & Associates, Inc.	Office: (201) 791-0075 Mobile: (201) 873-7543
Project Manager	Sixuan Wang YU & Associates, Inc.	Office: (201) 791-0075 Mobile (201) 988-3935
NYSDEC Project Manager	Erick Bower NYSDEC	Office: (518) 402-9824

EMERGENCY TELEPHONE NUMBERS:

Police Emergency	911
Fire	911
Ambulance	911
Primary Hospital – New York Hospital Queens	(718) 670-2000
Poison Control Center	(800) 222-1222
EPA National Response Center	(800) 424-8802
Below Ground Utilities – "CALL BEFORE YOU DIG"	(800) 922-4480
New York Department of Health	(518) 474-2121
CHEMTREC	(800) 424-9300
National Pesticide Information	(800) 845-6733

LOCAL HOSPITAL
Mount Sinai - Queens
25-10 30th Ave
Long Island City, NY 11102

Emergency Telephone: (718) 267-4285
Non-Emergency Telephone: (718) 932-1000

3.0 HEALTH AND SAFETY STAFF

The responsibilities of the health and safety staff are described in the following sections.

3.1 PROJECT MANAGER

The Project Manager (PM) has the overall responsibilities for the health and safety of site personnel. The PM will also ensure that adequate resources are provided to the field health and safety staff to carry out their responsibilities as described below. The PM will ensure that all activities are conducted in accordance with the HASP and will have the authority to suspend field activities if employees are in danger of injury or exposure to harmful agents. The PM's responsibilities include:

- Assurance that appropriate health and safety equipment and PPE are available for project personnel;
- Assurance that all personnel have received the appropriate training, and required medical examination before engaging in work activities; and
- Designation of a Health and Safety Officer (HSO) who will assist in enforcing compliance with the HASP.

3.2 HEALTH AND SAFETY OFFICER

The HSO has the responsibility to assist the PM in the implementation of this HASP and assist in the resolution of any outstanding safety issues that arise during site work. The HSO shall review changes to this plan due to modification of procedures or newly proposed site activities.

The HSO shall obtain and keep a log of all personnel meetings, appropriate training, medical qualifications for personnel involved with site work and personnel exposure monitoring and accident/incident reports. The logs will be kept in the project file in accordance with §29 CFR 1910.1020.

3.3 SITE HEALTH AND SAFETY OFFICER

The SHSO will be responsible for directing and coordinating all health and safety monitoring activities and ensuring that proper personal protective equipment is utilized by field teams. The SHSO will conduct periodic safety briefings and ensure that the field team members comply with this HASP. The SHSO reports to the PM to provide summaries and progress of field operations. The SHSO has stop-work authorization which will be executed upon their determination of an imminent safety hazard, emergency situation, and/or other potentially dangerous situations. Authorization to proceed with work will be issued by the PM after such action. The SHSO shall initiate and execute all contact with support facilities and personnel when this action is appropriate.

The SHSO may direct the site health and safety efforts through an assistant health and safety officer approved by the PM. The assistant will be responsible for implementation of the HASP and may direct or participate in activities, as appropriate, when this does not interfere with primary HSO responsibilities. Other responsibilities of the SHSO include:

- Ensure that all field personnel and visitors in the field comply with the requirements of this HASP.
- Maintain a log of personnel on-site each day. A copy of these logs will be sent to the PM. Originals will be kept in the project file.

- Coordinate periodic safety briefings and notify PM of any changes in work conditions or tasks that may require changes to the HASP.

- Manage health and safety equipment, including monitoring instruments and PPE, and oversee decontamination procedures.

- Maintain a health and safety logbook in which 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 and will be maintained by the PM.

- Delegate, if necessary and/or appropriate, some of these responsibilities to other on-site qualified employees.

3.4 SITE PERSONNEL

It is the responsibility of all site personnel to report any unsafe or potentially hazardous conditions to the SHSO. They should maintain knowledge of the information, instructions, and emergency response actions contained in this HASP. Additionally, they shall comply with rules, regulations and procedures as set forth in this HASP (and subsequent revisions) and aid in preventing admittance of unauthorized personnel within the work site.

4.0 SITE HISTORY AND DESCRIPTION

4.1 SITE DESCRIPTION

The Site is located at 11-35 31st Drive**,** Astoria, New York (Block 41, Lot 503), see Figure 1 for the Site location. The Site covers an approximately 9,800 square feet parcel of land bounded by multi-story residential apartment building with two-story parking garage to the north, 31st Drive and residential and light industrial buildings to the south, an asphalt paved parking lot and multi-family residential apartment buildings to the east, and an outdoor recreation area to the west (see Figure 2 for reference). The Site is currently vacant.

4.2 PROJECT BACKGROUND

A Phase I Environmental Site Assessment (ESA) was prepared by Impact Environmental Closures, Inc. (IEC) dated December 21, 2017. According to the Phase I ESA, the subject Site was initially developed as early as 1898 and utilized as a residence through at least the 1950s. The original warehouse building was constructed circa 1959 after which the Site was utilized as a commercial facility. A steel works had occupied the Site from 1967 to 2010. After which, two commercial transportation companies occupied the Site in 2014. The site is currently vacant.

A Phase II site investigation was conducted in December 2017 and a remedial investigation was conducted between June and August 2019 by IEC. These investigations revealed that surface and sub-surface soils above groundwater level were contaminated with VOCs, SVOCs, PCBs, pesticides and metals throughout the Site. The deep saturated soils below groundwater level were heavily contaminated with PCE in the vicinity of the former dipping tanks area, where the dense non aqueous phase liquid (DNAPL) was present. Groundwater sample results indicate VOCs (especially CVOCs), SVOCs (PAHs), PCBs (Aroclor-1254), and metals (iron, magnesium, manganese, sodium, and lead) contamination above Class GA groundwater criteria. CVOCs in soil vapor were detected on-site at concentrations exceeding NYSDOH Air Guideline Values.

5.0 HAZARD ASSESSMENT

This section discusses hazards that are anticipated to be encountered during site activities listed in Section 2.1, Scope of Work, in this HASP.

5.1 CHEMICAL HAZARDS

VOC's

The primary contaminants of concern on site are PCE and its associated degradation products, TCE, and BTEX compounds. The above-mentioned contaminants are anticipated to be encountered at the site at levels posing a minimal hazard to workers, the most likely risk being contact with contaminated soil or water, causing potential irritation to skin and/or eyes.

PCE is the most commonly used solvent in dry cleaning. It is a clear colorless liquid with low solubility, low flammability, and very high volatility. It is considered an irritant to the skin, eyes, and respiratory tract and is harmful if swallowed, inhaled, or absorbed through the skin. PCE is identified as a suspected carcinogen. Large exposures to PCE can damage the central nervous system, liver and kidneys. As levels of contamination in the breathing zone on site are expected to be far below both the ACGIH TLV of 25 ppm (TWA) and OSHA PEL of 100 ppm, site personnel should be adequately protected using Level D PPE – long sleeved pants and shirts, steel-toed boots, nitrile gloves and safety goggles, to minimize potential skin contact and irritation, and following proper sanitation procedures to minimize accidental contact or ingestion. TCE and cis-1,2-DCE are similar to PCE in potential health effects and physical properties.

Precautions taken to protect personnel from PCE are also considered sufficient in protecting them from its daughter products.

Benzene, toluene, ethylbenzene, and xylenes are common compounds found in petroleum products, such as gasoline. They are clear, colorless-to-light-yellow liquids with low solubility, high flammability and risk of explosion in the presence of heat, and very high volatility. BTEX compounds can be detected by their aromatic gasoline-like odor. They are considered irritants to the skin, eyes, and respiratory tract and are harmful if swallowed, inhaled, or absorbed through the skin. Benzene is a confirmed carcinogen, ethylbenzene is a suspected carcinogen, and toluene and xylenes are not classifiable as carcinogens. Large exposures to BTEX compounds can damage the central nervous system, cardiovascular system, respiratory system, and blood. As levels of contamination in the breathing zone on Site are expected to be below both the ACGIH TLV of 0.5 ppm (TWA) and OSHA PEL of 1.0 ppm (TWA) for benzene (which has the lowest exposure limits of all BTEX compounds), site personnel should be adequately protected using Modified Level D PPE – long sleeved pants and shirts, steel-toed boots, inner and outer nitrile gloves and safety goggles, to minimize potential skin contact and irritation, and following proper sanitation procedures to minimize accidental contact or ingestion.

Other petroleum-related VOC compounds that may be encountered on-site are similar to BTEX in potential health effects and physical properties. Precautions taken to protect personnel from BTEX are also considered sufficient in protecting them from other petroleum-related VOCs.

Metals

Based on Remedial Investigation (RI) by Impact Environmental, several inorganic constituents were detected at concentrations in exceedance of state and/or federal regulations. Arsenic, zinc, hexavalent chromium, cadmium, mercury, nickel, iron, and lead are the metals that were detected in soil samples at concentrations exceeding applicable criteria. Additionally, antimony, iron, magnesium, manganese, sodium and thallium were detected above the NYSDEC AWQS in groundwater in dissolved (filtered) water samples. On contact, these metals may cause eye and skin irritation. Ingestion of these metals may cause gastrointestinal irritation, acute renal failure, cardiopulmonary depression, and liver damage. These metals may be toxic to blood, brain, kidney, lung, liver, cardiovascular system, upper respiratory tract, and pancreas. Repeated or prolonged exposure to the substance can produce target organs damage.

Exposure to these metals poses the greatest risk to workers if inhaled or ingested, which is likely to occur in dusty conditions and as a result of direct contact. Workers not contacting soils, and workers not exposed to dusty conditions will be adequately protected in Level D PPE (as described in Section 7.0, Personal Protective Equipment).

Others

Other contaminants such as Semi Volatile Organic Compounds (SVOCs) and the pesticides 4,4'-DDE and 4,4'-DDT were detected in concentrations above UUSCOs. Based on presently available information, such contaminants are believed to be of relatively low concentrations and therefore may present a lower order of toxicity or hazard potential compared to other chemical hazardous.

5.1.1 Task Hazard Assessment

Well Installation and Sampling

The overall exposure to site chemicals is expected to be low for both equipment operators (drillers) and engineers/geologists (inspectors). Any potential exposure is primarily expected to occur through inhalation

and/or dermal contact and secondarily through accidental ingestion. Workers should be adequately protected with level D personal protective equipment (PPE) or modified Level D PPE, depending on the activity being carried out, and will make every effort to minimize direct contact with soil and groundwater (see Section 7.3 for details regarding PPE levels). Proper decontamination procedures and general sanitation will reduce the risk of contact or ingestion. Work on site will be monitored with a photo-ionization detector (PID) to determine the concentration of volatile organic compounds in the air, and workers will stop work or increase their level of PPE should airborne concentrations of volatile contaminants become too high, as laid out in section 8.2 – Action Levels.

5.2 BIOLOGICAL HAZARDS

Biological hazards present at the Site may include poisonous plants, insects, and animals.

- **Insect and spider bites** often cause minor swelling, redness, pain, and itching. These mild reactions are common and may last from a few hours to a few days. Home treatment is often all that is needed to relieve the symptoms of a mild reaction to common stinging or biting insects and spiders. Tuck pants into socks, wear long sleeves, use insect repellent, and avoid contact. The personnel should always look ahead to where they are walking, standing, sitting, leaning grabbing, lifting or reaching. Personnel should check for signs of insect/spider bites, such as redness, swelling and flu-like symptoms. Some people have more severe reactions to bites or stings, such as a severe allergic reaction (anaphylaxis) and shock. That can be life-threatening and require emergency care. If the employee knows that they might experience severe reactions, they must notify the HSO and bring any necessary medication or preventive measures to the Site.

- **Mosquitos** can carry West Nile Virus, which can cause milder symptoms including fever, headache, body aches, nausea, vomiting, and rash on the chest, stomach and back. More severe symptoms may include disorientation, tremors and convulsions, muscle weakness, loss of vision, numbness and paralysis. If bitten, monitor for symptoms, notify HSO, and get medical help if needed.

- **Small animals** may be present on the Site. Some animals may carry disease or poison and may cause injury by biting. Avoid unnecessary contact with animals. Use the buddy system in all areas of the site. If bitten, get medical help immediately. In the event of a snake bite, attempt to identify the snake as poisonous or non-poisonous to assist in the treatment.

5.3 PHYSICAL AND OPERATIONAL HAZARDS

5.3.1 General

A variety of physical hazards may be present during site activities. The most common hazards are slips, trips, falls, and heat and cold stress. Other physical hazards can be caused by motor vehicle and heavy equipment operation, the use of hand and power tools, and handling and storage of solvents and fuels. These hazards are not unique and are generally familiar to hazardous waste workers. Additional specific safety requirements may be covered during safety briefings at the project site.

Storage of flammable and combustible liquids shall be in accordance with OSHA requirements specified in §29 CFR 1910.106. Solvents shall be stored in approved secured containers and shall be properly labeled in accordance with the requirement of §29 CFR 1910.1200. Material Safety Data Sheets (MSDS) for hazardous materials brought on site shall be maintained by the site HSO.

Electrical cords used for hand and power tools shall be Underwriter Laboratories (UL) listed and all tools shall be properly grounded.

During servicing and maintenance of site equipment, appropriate lock-out/tag-out measures shall be implemented as required under §29 CFR 1910.147.

Personnel will be working on site in groups and will be able to monitor each other periodically during the project.

5.3.2 Back Injuries Due to Improper Lifting

Back injuries due to improper lifting can be prevented utilizing the following:

- Use proper lifting techniques. Lift with the legs, not the back. Keep loads close to the body and avoid twisting.
- Loads heavier than 50 pounds require a second person or mechanical device for lifting.
- Use mechanical devices such as drum dollies, hand trucks, and tool hoists (for lifting augers) to lift or move heavy loads whenever possible.

5.3.3 Traffic and Pedestrian Safety

Most work on site will be near streets. Personnel shall maintain a constant awareness of traffic moving in all directions. Safety vests should be worn whenever working on or near a roadway. Equipment and work areas will be appropriately marked with cones, barriers and signage.

During mobilization and demobilization of heavy equipment, additional precautions shall be taken to ensure pedestrian safety. These measures include:

- Use of flag personnel or spotters during equipment loading/unloading and movement near sidewalks or roadways.
- Placement of high-visibility cones and temporary barriers to delineate pedestrian walkways and work zones.
- Posting of warning signs to alert pedestrians of active equipment crossing or restricted access.
- Coordination with local property owners or authorities when mobilization occurs adjacent to public sidewalks.
- Scheduling mobilization activities, where feasible, to avoid peak pedestrian hours.
- Daily safety briefings will include a review of pedestrian safety measures.

The Site Health and Safety Officer (SHSO) will oversee implementation of these controls and monitor compliance during all mobilization activities.

5.3.4 Overhead Power Lines

In some areas of the site overhead power lines are present and may be affected during drill rig operation. Every effort shall be made to maintain a minimum equipment clearance of 10 feet from these power lines. However, should it be necessary to breach the clearance, prior to initiating any such work in/near these areas when there is a possibility that the equipment may touch and/or may potentially fall on the lines creating not only a severe electrocution hazard, but also a situation where power distribution may be affected, the Project Manager shall contact the Power Generation/Distribution Company to notify them of such potential and will work within the guidelines provided by the Power Generation/Distribution Company for safety of personnel and property. When work may be needed to be conducted near high power lines, employees engaged in this operation will be trained appropriately to address hazards associated with high voltage.

5.3.5 Below-Ground Utilities

Most work will be on streets or sidewalks where the presence of underground utilities, including power lines, is likely. Prior to any invasive activities, the drilling contractor will be responsible for coordinating a utility mark out. Upon arrival on site and before drilling, the drillers will inspect the worksite for any

indication of utilities which are not appropriately marked. If unmarked utilities are suspected, no drilling will take place until the location of utilities has been verified with the appropriate agencies. Either the drillers or the SHSO may at any point require hand clearing of borings, verification of utility locations, or stop work if they suspect a utility hazard. The drill rig must be appropriately grounded for the duration of work.

5.3.6 Weather

The SHSO shall monitor for visible symptoms of heat/cold stress in workers. Ambient weather reports will be monitored by the PM, and HSO/SHSO to determine the need to implement control measures for minimizing heat/cold stress.

Outdoor work will cease immediately upon the signs of impending thunderstorms and lightening, or other severe weather conditions.

5.3.7 Noise

During project activities, sonic drill rigs will be operated which could necessitate the use of hearing protection due to elevated noise levels. Hearing protection will be used as directed by the SHSO. As a general rule of thumb, when conversation between workers becomes difficult and normal speech cannot be understood within an arm's length of the persons talking, then hearing protection must be worn.

5.3.8 Fire and Explosion

The HSO shall identify, analyze and understand all fire and explosion hazards and associated effects that might be present at the site. A suitable control and mitigation systems for fire and explosion hazards should be implemented and supported throughout the project duration.

6.0 TRAINING AND MEDICAL SURVEILLANCE REQUIREMENTS

6.1 GENERAL HEALTH AND SAFETY TRAINING

In accordance with the requirements of §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 unless otherwise noted in the above reference. At 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 or are not "current" in their training shall not be allowed to work at any site activities in which they may be exposed to hazards (chemical or physical). For a site worker to be considered "current" for training purposes, their date of last training (initial, refresher or manager/supervisory) must be within the last twelve months.

Completion of an accredited 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, which must be documented.

6.2 MANAGER/SUPERVISOR TRAINING

In accordance with §29 CFR 1910.120, on-site management and supervisors who will be directly responsible for, or who supervise employees engaged in hazardous waste operations shall receive training as required by Section 6.1 above and at least 8 additional hours of specialized training on managing such operations at the time of the job assignment.

6.3 ANNUAL 8-HOUR REFRESHER TRAINING

Annual 8-hour refresher training will be required in accordance with §29 CFR 1910.120 of all hazardous waste site field personnel in order to maintain their qualifications for field work. The following topics will be reviewed: toxicology, respiratory protection, including air purifying and air supplied devices, medical surveillance, PPE and decontamination procedures.

6.4 SITE SPECIFIC TRAINING

Prior to commencement of field activities, all field 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. In addition, topics deemed necessary by the HSO/SHSO may be added to the above list.

The site-specific training shall also provide information regarding potential health hazards specific to the site contaminants, the likelihood of exposure and the precautionary measures including PPE, air and medical monitoring procedures to be implemented to protect against these hazards.

6.5 ON-SITE SAFETY BRIEFINGS

Project personnel and visitors will be given periodic on-site health and safety briefings by the HSO/SHSO, or 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 the site's environmental conditions. The briefings will also provide a forum to facilitate conformance with health and safety

requirements and to identify health and safety performance deficiencies noted during daily activities or as a result of Health and Safety (H&S) audits.

6.6 ADDITIONAL TRAINING

Additional training, if required for completion of field tasks during the project, will be identified and provided for field personnel as the work progresses.

6.7 SUBCONTRACTOR TRAINING

All field subcontractor personnel conducting work onsite that fall under the scope of this HASP will meet the requirements of §29 CFR 1910.120(e) and addressed in Sections 6.1 through 6.7 above.

6.8 MEDICAL SURVEILLANCE PROCEDURES

All site personnel performing field work at the site under the scope of this HASP are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f) (Hazardous Waste Operations). A physicians' medical release for work will be confirmed by the PM before an employee can begin site activities. The medical examination will, at a minimum, be provided annually and upon termination of hazardous waste site work if the last examination was not within the previous six months. Additional medical testing may be recommended by the HSO/SHSO in consultation with the consulting occupational physician if an overt exposure accident occurs, or if other site conditions warrant further medical surveillance.

A medical data sheet is provided in Figure 6-1. This medical data sheet will be completed by all on-site personnel and kept at the site. Where possible, this medical data sheet will accompany the personnel needing medical assistance or transport to hospital facilities.

FIGURE 6-1

MEDICAL DATA SHEET

This brief Medical Data Sheet will be completed by all on-site personnel and will be kept in the Command Post during the conduct of site operations. It is in no way a substitute for the Medical Surveillance Program requirements consistent with the health and safety policies established for hazardous waste operations at this site. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

PROJECT: **11-35 31st Drive, Astoria, NY 11106**

Name: _____

Home Telephone: _____

EMERGENCY CONTACT:

Name: _____

Relationship: _____

Phone number: _____

MEDICAL INFORMATION:

Allergies: _____

_____

Do you wear contact lenses: _____

Name of personal physician: _____

Telephone number: _____

7.0 SITE CONTROL, PERSONAL PROTECTIVE EQUIPMENT AND COMMUNICATIONS

7.1 GENERAL SITE CONTROL

At all times during site operations site control shall be maintained not only to prevent spread of contamination within the site, but also to prevent unauthorized entry into the site. Site control also includes the control of traffic to and from the site to least impact the general population in the area.

Visitors shall be required to first contact the HSO prior to allowing access to the site.

7.2 CONTAMINATION CONTROL

A three-zone approach will be employed in order to contain the potential spread of contamination from the site. The three zones will include the Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ) and the Support Zone (SZ).

7.2.1 Support Zone

The 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/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples. Meteorological monitoring will be observed and noted from this zone, as well as those factors pertaining to heat or cold stress.

7.2.2 Contamination Reduction Zone

The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides for an area for decontamination of personnel and portable equipment. The CRZ will be used for general site entry and egress in addition to access for heavy equipment and emergency support services.

7.2.3 Exclusion Zone

The area where contamination exists and where drilling and sampling is conducted is considered to be the exclusion zone. All areas of drilling and sampling, which contain hazardous materials, are considered the exclusion zone (EZ). The HSO/SHSO may establish more than one EZ where different levels of protection may be employed or different hazards exist (i.e., multiple drilling crews, different sampling crews). Personnel are not allowed in the EZ without each of the following:

- A buddy
- Appropriate personal protective equipment
- Medical authorization
- Training certification.

Any observation of activities will be conducted from an area upwind of the EZ as established by the HSO/SHSO.

7.3 PERSONAL PROTECTIVE EQUIPMENT

7.3.1 General

The level of protection worn by field personnel will be enforced by the SHSO. 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 HSO/SHSO. This 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.

7.3.2 Personal Protective Equipment Selection

For tasks requiring level B personal protective clothing (PPE), the following shall be used:

- Chemical protective suit (Saran)
- Gloves, inner and outer (nitrile)
- Boots, steel toe
- Boot covers
- Hard hat
- Hearing protection (as needed)

For tasks requiring level C PPE, the following shall be used:

- Chemical protective suit (Polycoated Tyvek)
- Gloves, inner and outer (nitrile)
- Boots, steel toe
- Boot covers
- Hard hat
- Eye protection (if not wearing full face respirators)
- Hearing protection (as needed)

For tasks requiring level D PPE, the following shall be used:

- Work clothes or plain uncoated coveralls
- Work gloves
- Boots, steel toe
- Hard hat
- Hearing protection (as needed)
- Eye protection

For tasks requiring level Modified level D PPE, the following shall be used:

- Work clothes or plain uncoated coveralls
- Gloves – inner and outer nitrile gloves
- Boots, steel toe
- Boot covers
- Hard hat
- Hearing protection (as needed)
- Eye protection

For tasks requiring respiratory protection, the following equipment shall be used:

Level B:	Air supplied respirators - Airline with escape pack or SCBA
Modified Level D:	Half-face air purifying respirator equipped with organic vapor/HEPA cartridges.
Level D:	No respiratory protection

All outer gloves and boot covers shall be securely taped to the protective clothing.

7.3.3 Initial Levels of Protection

The following are the initial levels of protection that shall be used for each planned field activity:

Activity	Level of Personal Protective Equipment	Level Respiratory Protection
Drilling		
Inspector	D (upgrade to modified level D if necessary)	D (upgrade to modified level D if necessary)
Driller	D (upgrade to modified level D if necessary)	D (upgrade to modified level D if necessary)
Sampling and Development		
Inspector	D (upgrade to modified level D if necessary)	D (upgrade to modified level D if necessary)

7.4 SAFETY EQUIPMENT

Safety and first aid equipment will be accessible in the support vehicle/area for the field crew. The following safety equipment shall be available:

- Standard Industrial First Aid Kits, fully stocked
- Portable emergency Eyewash Unit (capable of providing at least 15 minutes of continuous flushing ability)
- Field wash equipment

7.5 COMMUNICATIONS

Site personnel will have access to mobile telephones. If intrinsically safe radios are used then they will be rated as class I, division I, group c, d as defined by the National Electrical Code (NEC). The following hand signals shall be reviewed during site specific training shall be understood by the entire field team prior to commencement of site activities and shall be used when necessary during site operations.

Hand Signal	Meaning
Hand gripping throat	Out of air, can't breathe
Gripping partner's wrist/ place hands on waist	Leave area immediately, no debate
Hands on top of head	Need assistance
Thumbs up	OK, all right, I understand
Thumbs down	No, negative

8.0 AIR MONITORING

8.1 PERIODIC AIR MONITORING

The following monitoring instrument will be available for use during field operations:

- Photoionization Detector (PID)

The HSO/SHSO or designee shall conduct periodic site air monitoring during pertinent project operations. Organic vapor concentrations shall be measured using a PID during all site operations where existing site soils or water contaminated with VOCs are visually identified or otherwise suspected by the HSO/SHSO and during any site invasive operations identified in Section 2.0. Air monitoring results shall be interpreted conservatively to be protective of worker health. Organic vapor concentrations shall be measured upwind of the work site(s) to determine background concentrations at least twice a day, (once in the morning and once in the afternoon). Measurements shall be obtained in the breathing zones of personnel as well as in the area of the source.

8.2 ACTION LEVELS

Action levels for periodic monitoring instruments have been set in Table 8-1. The HSO/SHSO shall use professional judgment in interpreting the instrumentation response. These action levels may be modified as additional information becomes available regarding the extent, type of contamination and the potential for exposure to those contaminations during planned site activities. The SHSO shall direct personnel to upgrade to the specified level of personal protective equipment (PPE) when warranted by air monitoring results or other pertinent site conditions. The PPE may be downgraded when conditions warrant as dictated by air monitoring results and site conditions. The SHSO will make this decision upon review with the HSO.

The action levels for organic vapors have been set based on the potential presence of PCE.

8.3 INSTRUMENT CALIBRATION

Monitoring equipment will be calibrated and checked for proper operation daily, before the start-up of any field activities requiring monitoring. Before initiating field activities, background measurements will be obtained with each instrument upwind and away from potential site influences. Instrument calibration and background levels will be documented on daily air monitoring logs.

8.4 PERSONAL MONITORING

Personal monitoring shall be initiated based on periodic monitoring data. If site-monitoring efforts indicate the presence of PCE then personal monitoring shall be conducted for those individuals with the potential exposure to PCE. Personal air monitoring shall be conducted using established OSHA/NIOSH protocol. Air samples, including blanks shall be submitted to an American Industrial Hygiene Association (AIHA) accredited laboratory for sample analysis.

When periodic air monitoring action levels are exceeded on a routine basis, personal air monitoring will be conducted to confirm that employee exposures are within currently published occupational exposure limits and implemented site controls are adequate to continue to control worker exposures. Personal air monitoring for lead shall be conducted in accordance with established NIOSH/OSHA air sampling protocols and submitted to an AIHA accredited laboratory for analysis.

TABLE 8-1 ACTION LEVELS	
Monitoring Method: PID Instrument	
Activities Requiring Monitoring: Bedrock well installation and groundwater sampling.	
Monitoring Conducted By: Site Safety Officer	
Instrument Reading	Required Action
0 to 50 ppm	Level D
>50 to 100 ppm	Introduce engineering controls to reduce to background (e.g. fan) or respirator (modified level D). Leave area if applicable.
> 100 ppm	Stop Work and Consult HSO/SHSO

9.0 ADDITIONAL SAFE WORK PRACTICES

Work will be conducted in accordance with relevant OSHA regulations (1926 and 1910 CFR).

9.1 GENERAL

- Ignition sources such as open flames in the vicinity of the potentially flammable material are prohibited.
- When working in areas where flammable vapors may be present particular care must be exercised with tools and equipment that may be sources of ignition. All tools and equipment provided must be properly bonded and/or grounded.
- Approved and appropriate safety equipment as specified in Section 7.2 of this HASP shall be worn where required.
- Eye protection must be worn while working on site.
- Beards that interfere with respirator fit are not allowed for field personnel within the site boundaries as all site field personnel may be called upon to use respirator protection in some situation, and beards do not allow for proper respirator fit.
- No smoking, eating, drinking or applying of cosmetics is allowed in the contaminated areas.
- Contaminated tools and hands must be kept away from the face. Do not unnecessarily touch a contaminated surface or allow your clothing, tools or other equipment to do so.
- Persons with long hair and/or loose fitting clothing that could become tangled in power equipment must take adequate precaution.
- Report the presence of open wounds to the HSO prior to work in contaminated areas. If a wound occurs within such an area, report immediately to HSO and attend to the wound.
- Horseplay is prohibited in the work area.
- Follow good "housekeeping" practices to minimize the amount of material and equipment that has to be decontaminated or disposed of as contaminated wastes.
- Work under the influence of intoxicants, narcotics, or controlled substances is prohibited.
- All safety equipment shall be inspected regularly to ensure proper operation.
- All respiratory protective equipment use and maintenance shall meet, at a minimum, the OSHA requirements of 29 CFR 1910.134, including prohibitions on facial hair and other face piece-seal obstructions.
- All personnel entering the site during site operational hours shall be instructed in emergency procedures including locations of emergency equipment, procedures for site evacuation, emergency assembly areas and head count procedures, alarm systems and site communications.

- Personnel shall avoid walking directly through areas of obvious contamination and avoid handling contaminated materials directly.

- If field personnel perceive an unsafe condition or situation, the HSO or Field Operations Lead (FOL) will be notified immediately.

- All operations shall be planned and discussed with field personnel prior to beginning operations.

9.1.1 Operation of Heavy Equipment

Only trained equipment operators will be allowed to operate heavy machinery on-site. The number of personnel in the vicinity of heavy equipment operations and in contaminated areas shall be kept to a minimum. Those individuals not directly involved in work operations will be required to maintain a 30-foot distance so as not to interfere. All heavy equipment shall be properly maintained in a safe operating condition and be equipped with an audible back-up alarm.

9.2 PERSONNEL SAFETY

- Do not climb over or under obstacles.

- Always use the buddy system and line-of-sight.

- Practice contamination prevention on and off-site.

- Plan activities ahead of time.

- Apply immediate first aid to any and all cuts, scratches and abrasions.

- Report all accidents, no matter how minor, immediately to the HSO.

- Be alert to your own physical condition. Watch your buddy for signs of fatigue and/or exposure.

- Initiate a work/rest regime if ambient temperatures and protective clothing create a potential heat/cold stress situation.

- Do not proceed with work unless adequate natural light exists and appropriate supervision is present.

- Safety briefings will be held prior to the onset of remedial activities and regularly during the progress of site activities.

9.3 SAFETY PROCEDURES IN EXCLUSION ZONES

- The exclusion zone shall be maintained visually by the HSO/SHSO

- Only authorized personnel shall be allowed in the exclusion zone. All unauthorized persons must remain a safe distance upwind during field activities in order to prevent exposure to potential hazards.

- Line of sight and the buddy system shall be mandatory at all times.

- Prior to the start of activities in the exclusion zone, the HSO/SHSO shall establish a well-defined emergency exit escape route from each operating area of the exclusion zone. The emergency escape routes shall be familiar to all field personnel involved with the operation and shall be reviewed by the HSO/SHSO at site briefings.

- The number of authorized personnel within the exclusion zone during each task shall be minimized to include only those personnel essential for that task.

- The size of the exclusion area around all work locations shall be determined by the HSO in and shall be large enough to easily accommodate only those members of the field team actively engaged in the work, fire, emergency and site operations equipment.

- Immediate access to a source of water with sufficient volume, flow rate and pressure must be available for quick drenching in cases of emergency.

- Proper absorbent material will be available in the exclusion zone and will be used promptly in areas where spills or leaks occur.

- Instrumentation used for monitoring shall consist of those devices specified in Section 8.1. Members of the field team shall not proceed with any task until the field team is wearing the task-designated personnel protective equipment specified in Section 7.2.3 (or as modified by the HSO in response to measured site conditions), all instruments present shall be fully charged and properly calibrated.

10.0 DECONTAMINATION PROCEDURES

10.1 CONTAMINATION AVOIDANCE

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-examination. Procedures for contamination avoidance include:

Personnel

- 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, covering with tape, if necessary
- Particular care should be taken to protect any skin injuries
- Stay upwind of airborne contaminants
- Do not carry cigarettes, cosmetics, gum, etc., into contaminated areas

Heavy Equipment

- Care should be taken to limit the amount of contamination that comes in contact with the heavy equipment (e.g. tires)
- If contaminated tools are to be placed on non-contaminated equipment for transport to a decontamination area, plastic should be used to keep the equipment clean

10.2 PERSONNEL DECONTAMINATION

All personnel shall pass through an outlined decontamination procedure when exiting the exclusion zone at each location. Appendix C provides guidelines for decontamination procedures. The system will include a gross wash and rinse for all clothing and boots worn in the EZ as appropriate. All personnel will wash their hands, arms, neck and face after removing PPE in the wash facility located at the site. Respirators, airline and any other personnel equipment that comes in contact with contaminated soils shall pass through a field wash/cleaning in the CRZ and a final wash/cleaning at the end of the day.

10.3 EQUIPMENT DECONTAMINATION

Heavy equipment used at the site, which is potentially contaminated, will be decontaminated to prevent migration of hazardous material outside the site. All equipment will be decontaminated at a designated location in the site. This area will provide for the containment of any wastewater from the decontamination process. The HSO/SHSO shall engage designated personnel to ensure that all trucks/vehicles exiting the site are covered, material is stabilized with no free liquid and truck tires are free of contaminated soil.

10.4 EMERGENCY DECONTAMINATION

If emergency lifesaving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or omitted. The HSO/SHSO or designee will accompany contaminated victims to the medical facility to advise 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 safety 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, which 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 to allow for treatment to begin immediately.

10.5 ONSITE WASTE STORAGE AND DISPOSAL

All discarded materials, waste materials, or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on site. All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary, containers and/or bags properly secured, labeled and segregated for disposal.

All non-contaminated materials shall be collected and bagged for appropriate disposal as normal domestic waste. The prime contractor shall be responsible for disposal of all waste material at the site following applicable DOT, OSHA and RCRA requirements.

11.0 EMERGENCY PLAN

The emergency plan outlined in this section will be known by all personnel who will be working at the site prior to the start of work. The emergency plan will be available for use at all times during site work. As part of the onsite initial safety briefing the HSO/SHSO or designee shall review this Emergency Plan with site personnel.

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.

The HSO/SHSO will inform the site personnel about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. The Project Manager shall make necessary arrangements to be prepared for any emergencies that could occur.

The HSO/SHSO shall implement the emergency plan whenever conditions at the site warrant such action. The HSO/SHSO will be responsible for coordination of the evacuation, emergency treatment, and emergency transport of site personnel as necessary, and notification of emergency response units and the appropriate management staff.

11.1 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 seconds indicating the initiation of evacuation procedures. All personnel will evacuate and assemble near the Support Zone or a pre-determined location. The location shall be upwind of the site where possible. For efficient and safe site evacuation and assessment of the emergency situation, the emergency coordinator 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 HSO/SHSO or designee must see that access for emergency equipment is provided and that all equipment has been shut down and secured once the alarm has sounded. Once the safety of all personnel is established, the emergency response groups, as necessary, will be notified by telephone of the emergency.

While working inside buildings and enclosed areas, the HSO/SHSO shall ensure that all workers are familiar with the general layout of the area as well as nearest viable escape routes to minimize disorientation in the event of an emergency.

11.2 POTENTIAL OR ACTUAL FIRE

Immediate evacuation of site (air horn will sound in 10 seconds intervals), notify local fire and police department, and other appropriate emergency response groups if an actual fire or explosion takes place.

Police	911
Fire	911

11.3 PERSONNEL INJURY

Emergency first aid shall be applied on site as deemed necessary. Then decontaminate and transport the individual to the nearest medical facility, if needed. The HSO/SHSO will supply medical data sheets (Figure 6-1) to the medical personnel and complete the accident/incident reports in accordance with Section 12.4 of the HASP (see Appendix F).

The ambulance/rescue squad shall be contacted for transportation to the hospital as necessary in an emergency situation. However, since some situations may require transport of an injured person by other means, the hospital route is identified below. Appendix H provides a map to the hospital facility. Only in non-emergency situations shall an injured person be transported to the hospital by means other than an ambulance.

Primary hospital:

Mount Sinai - Queens
25-10 30th Ave
Long Island City, NY 11102

Emergency Telephone: (718) 267-4285
Non-Emergency Telephone: (718) 932-1000

Directions to the hospital are provided in Appendix H.

11.4 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. Health and Safety Officer
2. Project Manager
3. The employer of any injured worker, if not an employee

Written confirmations of verbal reports are to be submitted within 24 hours by the HSO/SHSO or designee. The report form entitled "Accident Data Report" found in Appendix F, is to be used for this purpose. All representatives contacted by telephone are to receive a copy of this report.

For reporting purposes, the term accident refers to fatalities, lost time injuries, spill or exposure to hazardous materials (radioactive, toxic, explosive, flammable or corrosive), fire, explosion, damage to property, or potential occurrence of the above.

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, which is released by patient consent, is to be filed in the individual's medical records and treated as confidential.

11.5 OVERT PERSONNEL EXPOSURE

SKIN CONTACT:	Use copious amounts of soap and water. Wash/rinse affected area thoroughly, and then provide appropriate medical attention.
INHALATION:	Move to fresh air and/or, if necessary, decontaminate/transport to hospital.
INGESTION:	Decontaminate and transport to emergency medical facility.
PUNCTURE WOUND OR LACERATIONS:	Decontaminate and transport to medical facility.

11.6 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the HSO/SHSO or designee will determine if work can continue without compromising the health and safety of field personnel. Some of the items to be considered prior to determining if work should continue are the following:

- Potential for heat stress and heat-related illnesses
- Potential for cold stress and cold-related illnesses
- Treacherous weather-related working conditions
- Potential for electric storms

Site activities will be limited to daylight hours (unless adequate artificial lighting is provided) and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lightning. Observe daily weather reports and evacuate if necessary in case of inclement weather conditions.

11.7 SPILL PREVENTION AND CONTROL PLAN

All small spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the Material Safety Data Sheet (MSDS) will be consulted to assist in determining proper waste characterization and the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Burms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill.

Construction vehicles shall have spill kits on them with enough material to contain and absorb the worst-case spill from that vehicle. All vehicles and equipment shall be inspected prior to being admitted on site. Any vehicle or piece of equipment that develops a leak while on Site will be taken out of service and removed from the job site.

The HSO/SHSO or designee shall take the following seven steps:

1. Determine the nature, identity and amounts of major spills.

2. Make sure all unnecessary persons are removed from the spill area.

3. Notify the Project Manager and Health and Safety Officer.

4. Use proper PPE

5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the or clean up the spill (diesel only vehicles, air operated pumps, etc.).

6. If possible, try to stop the leak with appropriate material.

7. Remove all surrounding materials that can react or compound with the spill.

In addition to the spill control and response procedures described above, onsite HSO/SHSO will coordinate activities relative to spill response and control actions. Notification to the Project Manager must be immediate and, to the extent possible, include the following information:

- Time and location of the spill;
- Type and nature of the material spilled;
- Amount spilled;
- Whether the spill has affected or has a potential to effect a waterway or sewer;
- A brief description of affected areas/equipment;
- Whether the spill has been contained; and
- Expected time of cleanup completion. If spill cleanup cannot be handled by on site personnel alone, such fact must be conveyed to the Project Manager immediately.

12.0 LOGS, REPORTS AND RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping for the site.

12.1 HASP FIELD CHANGE REQUEST

In order to initiate a change to this HASP during field operations a HASP field change request must be completed. The Project Manager approval is required. The original will be kept in the project file.

12.2 MEDICAL AND TRAINING RECORDS

Medical and training records are to be maintained by the individual employer. Subcontractor employer must provide verification of training and medical qualification to the HSO/SHSO. The HSO/SHSO 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, Project Manager.

12.3 ON-SITE LOG

The on-site HSO/SHSO or designee will keep a daily personnel log. A copy of these logs will be sent to the Project Manager. Originals will be kept in the project file.

12.4 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 1910.1020. The originals will be sent to the employer of the employee with a copy kept in the project file.

Employees will be notified of their personal monitoring results in accordance with applicable OSHA Standard.

12.5 ACCIDENT/INCIDENT REPORTS

An accident/incident report must be completed following procedures given in Section 11.4 of this HASP. The originals will be sent to the employer of the affected employee. A copy of the forms will be kept in the project file.

12.6 OSHA FORM 300

An OSHA Form 300 (Log of Occupational Injuries and Illnesses) will be kept at the project 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 Project Manager for filing. Subcontractor employees must also meet the requirements of maintaining an OSHA 300 Form.

12.7 HEALTH AND SAFETY FIELD LOG BOOKS

The HSO/SHSO or designee will maintain a health and safety logbook in which 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 and will be maintained in the project files.

12.8 MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheets (MSDS) will be obtained and kept on file at the project site for each hazardous chemical brought to, used, or stored at the site.

13.0 AUTHORIZATIONS

Personnel authorized to enter the site while operations are being conducted must be approved by the HSO. Authorization will involve completion of appropriate training courses and medical examination requirements as required by OSHA 29 CFR 1910.120 and review and sign-off on this HASP.

1. Contractor and subcontractor personnel authorized to perform work at 11-35 31st Drive, Astoria, NY.

1. _____	11. _____
2. _____	12. _____
3. _____	13. _____
4. _____	14. _____
5. _____	15. _____
6. _____	16. _____
7. _____	17. _____
8. _____	18. _____
9. _____	19. _____
10. _____	20._____

2. Other Personnel Authorized to Enter Site:

1. _____	11. _____
2. _____	12. _____
3. _____	13. _____
4. _____	14. _____
5. _____	15. _____
6. _____	16. _____
7. _____	17. _____
8. _____	18. _____
9. _____	19. _____
10. _____	20. _____

14.0 FIELD TEAM REVIEW

Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site.

Team Members:
I have read the plan and/or been verbally advised about the plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project and may be subject to disciplinary actions for violating any of the safety requirements specified in the Health and Safety Plan.

Print Name	Signature	Affiliation/Title	Date

Appendices

Appendix A – Field Change Request Form

Health & Safety Plan
Change Notice

PROJECT: H&S-CN

1) HASP VERSION:_____ SECTION:_____ PAGE(s):_____

RE: __ Change to existing HASP Anticipated Revision date _____

__ Addition to existing HASP

__ Other:_____

_____CONT.___

2) PROPOSED CHANGE: _____

_____

_____

_____CONT.__

3) REASON FOR PROPOSED CHANGE(s)

__ Required by SPEC or Change Order
__ Disposition of Deficiency
__ Change in Regulatory or Other Requirement
__ Operational Experience

__ Other: _____

_____CONT.__

4) EXHIBITS ATTACHED __ NO __ YES (if YES, describe)_____

_____CONT.__

5) APPROVALS PROJECT MANAGER: _____ Date: _____

SITE MANAGER: _____ Date: _____

H&S MANAGER: _____ Date: _____

Client Approval Required __ NO __ YES (if YES, date submitted) _____.

6) CLIENT APPROVAL ___ APPROVED __ REMANDED __ REJECTED

Comments:_____

_____

_____CONT.___

Client Representative:_____ Date: _____

7) DISTRIBUTION AFTER APPROVAL

X HASP UPDATE LIST __ OTHER: _____
X CLIENT _____
X PROJECT FILES _____

8) PREPARED BY:_____ Date: _____

Title: _____

Appendix B – Material Safety Data Sheets

SAFETY DATA SHEET

Version 6.4
Revision Date 07/22/2022
Print Date 10/08/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : 1,1,1-Trichloroethane

Product Number : 235571
Brand : Aldrich
Index-No. : 602-013-00-2
CAS-No. : 71-55-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word Warning

Hazard statement(s)
H315 Causes skin irritation.

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operates as MilliporeSigma in the US and Canada

H332	Harmful if inhaled.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	'Chlorothene' Methylchloroform
Formula	:	$C_2H_3Cl_3$
Molecular weight	:	133.40 g/mol
CAS-No.	:	71-55-6
EC-No.	:	200-756-3
Index-No.	:	602-013-00-2

Component	Classification	Concentration
1,1,1-Trichloroethane		
	Acute Tox. 4; Aquatic Acute 3; Ozone 1; H332, H402, H420	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Consult a physician. Show this material safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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operates as MilliporeSigma in the US and Canada

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapor or mist.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
For precautions see section 2.2.

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7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place.

Storage class
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloroethane	71-55-6	TWA	350 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		
		STEL	450 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Not classifiable as a human carcinogen		
		C	350 ppm 1,900 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	350 ppm 1,900 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	350 ppm 1,900 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	450 ppm 2,450 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	800 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
1,1,1-Trichloroethane	71-55-6	Methyl chloroform	20parts per million	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			

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		Methyl chloroform	700 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-34.99 °C (-30.98 °F)
f)	Initial boiling point and boiling range	72.0 - 75.0 °C 161.6 - 167.0 °F
g)	Flash point	()No data available

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h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 15 %(V) Lower explosion limit: 7.5 %(V)
k)	Vapor pressure	133.3 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	No data available
m)	Density	1.34 g/cm3
	Relative density	No data available
n)	Water solubility	1.25 g/l at 23 °C (73 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.49
p)	Autoignition temperature	537.0 °C (998.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Contains the following stabilizer(s):
Low alkyl epoxide (0.05 %)

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Potassium, Magnesium, Sodium/sodium oxides, Zinc, Strong bases

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 9,600 mg/kg
Symptoms: Nausea, Vomiting, Risk of aspiration upon vomiting., Aspiration may cause pulmonary edema and pneumonitis.
Remarks: (RTECS)
Acute toxicity estimate Inhalation - 4 h - 19 mg/l - vapor(Calculation method)

Inhalation: absorption
Dermal: absorption

Skin corrosion/irritation
Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Carcinogenicity
No data available

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., prolonged or repeated exposure can cause:, narcosis, Liver injury may occur., Kidney injury may occur.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:

After absorption:

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Headache
Dizziness
Tiredness
narcosis
drop in blood pressure
Unconsciousness

After uptake of large quantities:

depressed respiration
cardiovascular disorders

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	static test LC50 - Pimephales promelas (fathead minnow) - 52.8 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 530 mg/l - 48 h (US-EPA)
Toxicity to algae	static test EC50 - Pseudokirchneriella subcapitata (algae) - 41 mg/l - 72 h (OECD Test Guideline 201)
	static test NOEC - Pseudokirchneriella subcapitata (green algae) - 7.8 mg/l - 72 h (OECD Test Guideline 201)
	IC50 - Scenedesmus capricornutum (fresh water algae) - > 670 mg/l - 96 h Remarks: (Lit.)
Toxicity to bacteria	EC50 - Sewage sludge - 360 mg/l - 30 min (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability	Result: 0 % - Not readily biodegradable. (OECD Test Guideline 301C)

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

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12.7 Other adverse effects

Biological effects:
Hazard for drinking water supplies.
Further information on ecology
Substance which may present a danger to the structure and/or the functioning of the stratospheric ozone layer according to EC Regulation No 2037/2000 (listed in Annex I, Group V).
Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 2831 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: 1,1,1-TRICHLOROETHANE

IATA
UN number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane

SECTION 15: Regulatory information

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2020-07-14

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

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	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2020-07-14

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2020-07-14

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2020-07-14

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.4 Revision Date: 07/22/2022 Print Date: 10/08/2022

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SAFETY DATA SHEET

Version 6.2
Revision Date 01/15/2020
Print Date 12/10/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : 1,1,1,2-Tetrachloroethane

Product Number : T7209
Brand : SIGALD
CAS-No. : 630-20-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Serious eye damage (Category 1), H318
Carcinogenicity (Category 2), H351
Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

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Hazard statement(s)	
H302 + H332	Harmful if swallowed or if inhaled.
H318	Causes serious eye damage.
H351	Suspected of causing cancer.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	$C_2H_2Cl_4$
Molecular weight	:	167.85 g/mol
CAS-No.	:	630-20-6
EC-No.	:	211-135-1

Component	Classification	Concentration
1,1,1,2-Tetrachloroethane		
	Acute Tox. 4; Eye Dam. 1; Carc. 2; Aquatic Acute 3; Aquatic Chronic 3; H302, H332, H318, H351, H402, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

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6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm

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Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-70.2 °C (-94.4 °F)
f)	Initial boiling point and boiling range	138 °C 280 °F - lit.
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	18.7 hPa at 25.0 °C (77.0 °F)
l)	Vapour density	No data available

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m)	Relative density	1.598 g/cm3 at 25 °C (77 °F)
n)	Water solubility	slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 2.66
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong bases

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 670.0 mg/kg
LC50 Inhalation - Rat - 4 h - 2100 ppm
Remarks: Diarrhoea
LD50 Dermal - Rabbit - 20,000 mg/kg
No data available

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Skin corrosion/irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Severe eye irritation - 24 h
(Draize Test)

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.
Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (1,1,1,2-Tetrachloroethane)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KI8450000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Nerves. -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 16.00 - 24.00 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 17.00 - 30.00 mg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

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12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 2810 Class: 6.1 Packing group: III
Proper shipping name: Toxic, liquids, organic, n.o.s. (1,1,1,2-Tetrachloroethane)
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 2810 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC LIQUID, ORGANIC, N.O.S. (1,1,1,2-Tetrachloroethane)

IATA
UN number: 2810 Class: 6.1 Packing group: III
Proper shipping name: Toxic liquid, organic, n.o.s. (1,1,1,2-Tetrachloroethane)

SECTION 15: Regulatory information

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

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SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1,2-Tetrachloroethane	630-20-6	2018-04-24

SECTION 16: Other information

Further information
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Version: 6.2 Revision Date: 01/15/2020 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.5
Revision Date 08/05/2024
Print Date 08/06/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : 4,4'-DDE

Product Number : 35487
Brand : Sigma-Aldrich
CAS-No. : 72-55-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 3), H301
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

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For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word Danger

Hazard Statements

H301	Toxic if swallowed.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary Statements

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethene

Formula : $C_{14}H_8Cl_4$
Molecular weight : 318.03 g/mol
CAS-No. : 72-55-9
EC-No. : 200-784-6

Component	Classification	Concentration
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene		
	Acute Tox. 3; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301, H351, H372, H400,	<= 100 %

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	H410 M-Factor - Aquatic Acute: 100	

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures
No data available

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media
No data available

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas
Combustible.

5.3 Advice for firefighters
No data available

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
For personal protection see section 8.

6.2 Environmental precautions
No data available

6.3 Methods and materials for containment and cleaning up
No data available

6.4 Reference to other sections
For disposal see section 13.

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SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
No data available

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls
No data available

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/ range: 88.0 - 90.0 °C (190.4 - 194.0 °F)
f)	Initial boiling point and boiling range	No data available
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	< 0.000 hPa
l)	Vapor density	No data available
m)	Density	No data available
	Relative density	No data available

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n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 6.51
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
No data available

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong bases

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 87.0 mg/kg
Remarks: The value is given in analogy to the following substances: 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation
Remarks: No data available

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Serious eye damage/eye irritation
Remarks: No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.
Limited evidence of carcinogenicity in animal studies

IARC: 2A - Group 2A: Probably carcinogenic to humans (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Remarks: No data available
The value is given in analogy to the following substances: 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
No data available

11.2 Additional Information

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 0.01 mg/l - 96 h Remarks: The value is given in analogy to the following substances: 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
	LC50 - Lepomis macrochirus (Bluegill sunfish) - 0.01 mg/l - 96 h Remarks: The value is given in analogy to the following substances: 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

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	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96 h Remarks: The value is given in analogy to the following substances: 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h Remarks: The value is given in analogy to the following substances: 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
Toxicity to fish(Chronic toxicity)	NOEC - Oncorhynchus mykiss (rainbow trout) - 113 mg/l - 3.0 d Remarks: The value is given in analogy to the following substances: 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	Gambusia affinis (Mosquito fish) - 33 d - 3.84 µg/l(2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene) Bioconcentration factor (BCF): 12,037

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods
No data available

SECTION 14: Transport information

DOT (US)
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

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Reportable Quantity (RQ): 1 lbs
Marine pollutant: yes Poison Inhalation Hazard: No

IMDG
UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)
Marine pollutant : yes

IATA
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

SECTION 15: Regulatory information

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	1	1

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

Components	CAS-No.	Component TPQ (lbs)

SARA 311/312 Hazards : Acute Health Hazard
Chronic Health Hazard

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

No components are subject to the Massachusetts Right to Know Act.

Massachusetts Right To Know

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know

2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene 72-55-9

Pennsylvania Right To Know

2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene 72-55-9

Maine Chemicals of High Concern

Product does not contain any listed chemicals

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Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

New Jersey Right To Know

2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene 72-55-9

The ingredients of this product are reported in the following inventories:

TSCA : Product contains substance(s) not listed on TSCA inventory.

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16: Other information

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.5 Revision Date: 08/05/2024 Print Date: 08/06/2024

The life science business of Merck KGaA, Darmstadt, Germany
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SAFETY DATA SHEET

Version 8.3
Revision Date 12/05/2023
Print Date 08/10/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : 4,4′-DDT

Product Number : C8894
Brand : Sigma
Index-No. : 602-045-00-7
CAS-No. : 50-29-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 3), H311
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

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Pictogram	
Signal Word	Danger

Hazard Statements

H301 + H311	Toxic if swallowed or in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary Statements

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water.Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	$C_{14}H_9Cl_5$
Molecular weight	:	354.49 g/mol
CAS-No.	:	50-29-3
EC-No.	:	200-024-3
Index-No.	:	602-045-00-7

Component	Classification	Concentration
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane		
	Acute Tox. 3; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301, H311, H351, H372,	<= 100 %

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	H400, H410 M-Factor - Aquatic Acute: 100 - Aquatic Chronic: 100	

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas
Combustible.

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Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.
Storage stability Recommended storage temperature
2 - 8 °C

Storage class

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Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	TWA	1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
		TWA	0.5 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	1 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection

Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please

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contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Body Protection
protective clothing

Respiratory protection
Recommended Filter type: Filter type P3
The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 107.0 - 109.0 °C (224.6 - 228.2 °F)
f)	Initial boiling point and boiling range	260.0 °C 500.0 °F
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available

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j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	0.000002 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	No data available
m)	Density	0.99 g/cm3
	Relative density	No data available
n)	Water solubility	slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 6.91 - Potential bioaccumulation
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Violent reactions possible with:
Oxidizing agents
iron/iron-containing compounds

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 87.0 mg/kg
Remarks: (RTECS)
Inhalation: No data available
LD50 Dermal - Rabbit - 300.0 mg/kg
Remarks: Behavioral:Tremor.
Behavioral:Muscle weakness.
Behavioral:Ataxia.
(RTECS)

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
Suspected of causing cancer.

IARC:	2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
NTP:	RAHC - Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Ingestion - Causes damage to organs through prolonged or repeated exposure.
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Aspiration hazard
No data available

11.2 Additional Information

RTECS: KJ3325000
CNS stimulation., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

The life science business of Merck KGaA, Darmstadt, Germany
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Pancreas. -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96.0 h Remarks: (ECOTOX Database) (Regulation (EC) No 1272/2008, Annex VI)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h Remarks: (ECOTOX Database) (Regulation (EC) No 1272/2008, Annex VI)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 20 d - 0.001 mg/l(1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane) Bioconcentration factor (BCF): 46,670

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

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SECTION 14: Transport information

DOT (US)

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: yes Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Marine pollutant : yes

IATA

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

California Prop. 65 Components

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2008-06-17

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SECTION 16: Other information

Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

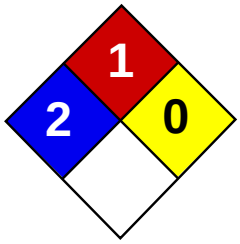
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Version: 8.3 Revision Date: 12/05/2023 Print Date: 08/10/2024

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada







Material Safety Data Sheet
Antimony MSDS

Section 1: Chemical Product and Company Identification

Product Name: Antimony

Catalog Codes: SLA1453, SLA4462

CAS#: 7440-36-0

RTECS: CC4025000

TSCA: TSCA 8(b) inventory: Antimony

CI#: Not available.

Synonym: Stibium

Chemical Name: Not available.

Chemical Formula: Sb

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
Antimony	7440-36-0	100

Toxicological Data on Ingredients: Antimony: ORAL (LD50): Acute: 7000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

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 blood, kidneys, lungs, the nervous system, liver, 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.

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.

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: 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.

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 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. Avoid contact with skin and eyes.

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:
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: 0.5 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: 121.75 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 1635°C (2975°F)

Melting Point: 630°C (1166°F)

Critical Temperature: Not available.

Specific Gravity: 6.691 (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: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 7000 mg/kg [Rat].

Chronic Effects on Humans: Causes damage to the following organs: blood, kidneys, lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

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 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: : Antimony powder UNNA: UN2871 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Antimony Massachusetts RTK: Antimony TSCA 8(b) inventory: Antimony

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-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36/38- Irritating to eyes and skin.

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.

Created: 10/11/2005 11:19 AM

Last Updated: 05/21/2013 12:00 PM

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SAFETY DATA SHEET

Revision Date 20-Feb-2020 **Revision Number** 2

1. Identification

Product Name **Arsenic powder**

Cat No. : **10101**

CAS-No 7440-38-2
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Emergency Telephone Number
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.
After normal business hours, call Carechem 24 at (866) 928-0789.

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 3
Acute Inhalation Toxicity - Dusts and Mists	Category 3
Carcinogenicity	Category 1A

Label Elements

Signal Word
Danger

Hazard Statements
May cause cancer
Toxic if swallowed or if inhaled



Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Arsenic	7440-38-2	<=100

4. First-aid measures

General Advice
Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact
In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation
Remove to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion
Do NOT induce vomiting. Call a physician or poison control center immediately.

Most important symptoms and effects	None reasonably foreseeable.
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	approved class D extinguishers. Do not use water or foam.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products
arsenic oxides.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	0	-

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
Environmental Precautions	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. Should not be released into the environment.
Methods for Containment and Clean Up	Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

7. Handling and storage

Handling	Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Use only under a chemical fume hood. Do not breathe (dust, vapor, mist, gas). Do not ingest. If swallowed then seek immediate medical assistance.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Arsenic	TWA: 0.01 mg/m³	(Vacated) TWA: 0.5 mg/m³	IDLH: 5 mg/m³ Ceiling: 0.002 mg/m³	TWA: 0.01 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection 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 and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection 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.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	No information available
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	817 °C / 1502.6 °F
Boiling Point/Range	614 °C / 1137.2 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.01 hPa @ 267 °C
Vapor Density	Not applicable
Specific Gravity	5.778 g/cm3
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	As
Molecular Weight	74.92

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Oxidizing agent

Hazardous Decomposition Products arsenic oxides

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Arsenic	LD50 = 15 mg/kg (Rat) LD50 = 763 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Arsenic	7440-38-2	Group 1	Known	A1	X	A1

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment. May cause long-term adverse effects in the environment. Do not allow material to contaminate ground water system.

Persistence and Degradability Insoluble in water May persist

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN1558
Proper Shipping Name	ARSENIC
Hazard Class	6.1
Packing Group	II

TDG

UN-No	UN1558
Proper Shipping Name	ARSENIC
Hazard Class	6.1
Packing Group	II

IATA

UN-No	UN1558
Proper Shipping Name	ARSENIC
Hazard Class	6.1
Packing Group	II

IMDG/IMO

UN-No	UN1558
Proper Shipping Name	ARSENIC
Hazard Class	6.1
Packing Group	II

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Arsenic	7440-38-2	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Arsenic	7440-38-2	X	-	231-148-6	X	X	X	X	KE-01933

U.S. Federal Regulations

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Arsenic	7440-38-2	<=100	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Arsenic	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Arsenic	X		-

OSHA - Occupational Safety and Health Administration Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Arsenic	10 µg/m³ TWA 5 µg/m³ Action Level	-

CERCLA Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Arsenic	1 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Arsenic	7440-38-2	Carcinogen	0.06 µg/day 10 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Arsenic	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By	Health, Safety and Environmental Department Email: tech@alfa.com www.alfa.com
Revision Date	20-Feb-2020
Print Date	20-Feb-2020
Revision Summary	SDS authoring systems update, replaces ChemGes SDS No. 7440-38-2/1.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Benzene

Section 1. Identification

GHS product identifier : Benzene

Chemical name : benzene

Other means of identification : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

Product type : Liquid.

Product use : Synthetic/Analytical chemistry.

Synonym : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

SDS # : 001062

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 2
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
GERM CELL MUTAGENICITY - Category 1
CARCINOGENICITY - Category 1
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1

GHS label elements

Hazard pictograms :



Signal word : Danger

Hazard statements : Highly flammable liquid and vapor.
Causes skin irritation.
Causes serious eye irritation.
May cause genetic defects.
May cause cancer.
Causes damage to organs through prolonged or repeated exposure.
May form explosive mixtures with air.

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention : Obtain special instructions before use. Wear protective gloves. Wear protective clothing. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating or lighting equipment. Use non-sparking tools. Take action to prevent static discharges. Keep container tightly closed. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash thoroughly after handling.

Section 2. Hazards identification

Response : IF exposed or concerned: Get medical advice or attention. Take off contaminated clothing and wash it before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : benzene

Other means of identification : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

Product code : 001062

CAS number/other identifiers

CAS number : 71-43-2

Ingredient name	%	CAS number
benzene	100	71-43-2

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Section 4. First aid measures

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:, pain or irritation, watering, redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:, irritation, redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Highly flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Section 6. Accidental release measures

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Do not ingest. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Do not breathe vapor or mist. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Store locked up. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
benzene	**ACGIH TLV (United States, 3/2019).** **Absorbed through skin.** STEL: 8 mg/m³ 15 minutes. STEL: 2.5 ppm 15 minutes. TWA: 1.6 mg/m³ 8 hours. TWA: 0.5 ppm 8 hours. **NIOSH REL (United States, 10/2016).** STEL: 1 ppm 15 minutes. TWA: 0.1 ppm 10 hours. **OSHA PEL (United States, 5/2018).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL Z2 (United States, 2/2013).** AMP: 50 ppm 10 minutes. CEIL: 25 ppm TWA: 10 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Section 8. Exposure controls/personal protection

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid. [Watery liquid.]

Color : Colorless. Yellowish.

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Melting point : 5.49°C (41.9°F)

Boiling point : 80.09°C (176.2°F)

Critical temperature : 288.95°C (552.1°F)

Flash point : Closed cup: -11°C (12.2°F)

Evaporation rate : 3.5 (butyl acetate = 1)

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 1.2%
Upper: 7.8%

Vapor pressure : 10 kPa (75.01 mm Hg) [room temperature]

Vapor density : 2.7 (Air = 1)

Specific Volume (ft ^{3}/lb) : 1.1403

Gas Density (lb/ft ^{3}) : 0.877 (20°C / 68 to °F)

Relative density : 0.88

Solubility : Not available.

Solubility in water : 1.88 g/l

Partition coefficient: n-octanol/water : 2.13

Auto-ignition temperature : 498°C (928.4°F)

Decomposition temperature : Not available.

Viscosity : Dynamic (room temperature): 0.6 mPa·s (0.6 cP)

Flow time (ISO 2431) : Not available.

Molecular weight : 78.12 g/mole

Aerosol product

Heat of combustion : -40611960 J/kg

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials:
oxidizing materials

Section 10. Stability and reactivity

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
benzene	LC50 Inhalation Gas. LD50 Oral	Rat Rat	10000 ppm 930 mg/kg	7 hours -

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
benzene	Eyes - Moderate irritant Eyes - Severe irritant Skin - Mild irritant Skin - Mild irritant Skin - Moderate irritant	Rabbit Rabbit Rat Rabbit Rabbit	- - - - -	88 mg 24 hours 2 mg 8 hours 60 Ul 24 hours 15 mg 24 hours 20 mg	- - - - -

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
benzene	+	1	Known to be a human carcinogen.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
benzene	Category 1	-	-

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Section 11. Toxicological information

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain or irritation, watering, redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:, irritation, redness

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : Causes damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : May cause genetic defects.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
benzene	Acute EC50 29000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 1600000 µg/l Fresh water	Algae - Selenastrum sp.	96 hours
	Acute EC50 9.23 mg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 21 mg/l Marine water	Crustaceans - Artemia salina	48 hours
	Acute LC50 5.28 ul/L Fresh water	Fish - Oncorhynchus gorbuscha - Fry	96 hours
	Chronic EC10 >1360 mg/l Fresh water	Algae - Scenedesmus subspicatus	96 hours
	Chronic NOEC 98 mg/l Fresh water	Daphnia - Daphnia magna	21 days
	Chronic NOEC 1.5 to 5.4 ul/L Marine water	Fish - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling)	4 weeks

Section 12. Ecological information

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
benzene	2.13	11	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Benzene (I,T)	71-43-2	Listed	U019

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1114	UN1114	UN1114	UN1114	UN1114
UN proper shipping name	BENZENE	BENZENE	BENZENE	BENZENE	BENZENE
Transport hazard class(es)	3 	3 	3 	3 	3 
Packing group	II	II	II	II	II
Environmental hazards	No.	No.	No.	No.	No.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 14. Transport information

Additional information

DOT Classification : **Reportable quantity** 10 lbs / 4.54 kg [1.3675 gal / 5.1767 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Quantity limitation Passenger aircraft/rail: 5 L. Cargo aircraft: 60 L.

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3).
Explosive Limit and Limited Quantity Index 1
Passenger Carrying Road or Rail Index 5

IATA : **Quantity limitation** Passenger and Cargo Aircraft: 5 L. Cargo Aircraft Only: 60 L. Limited Quantities - Passenger Aircraft: 1 L.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to IMO instruments : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
Clean Water Act (CWA) 307: benzene
Clean Water Act (CWA) 311: benzene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	benzene	71-43-2	100
Supplier notification	benzene	71-43-2	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

Section 15. Regulatory information

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

⚠ **WARNING**: This product can expose you to Benzene, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Ingredient name	No significant risk level	Maximum acceptable dosage level
Benzene	Yes.	Yes.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Thailand : Not determined.

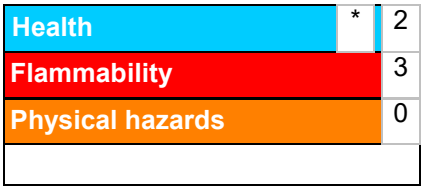
Turkey : This material is listed or exempted.

United States : This material is active or exempted.

Viet Nam : This material is listed or exempted.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Section 16. Other information

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE LIQUIDS - Category 2	Expert judgment
SKIN IRRITATION - Category 2	Expert judgment
EYE IRRITATION - Category 2A	Expert judgment
GERM CELL MUTAGENICITY - Category 1	Expert judgment
CARCINOGENICITY - Category 1	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1	Expert judgment

History

Date of printing : 6/1/2020

Date of issue/Date of revision : 6/1/2020

Date of previous issue : No previous validation

Version : 1

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Version 6.7
Revision Date 02/07/2023
Print Date 07/13/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Cadmium

Product Number : 265411
Brand : Aldrich
CAS-No. : 7440-43-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Inhalation (Category 2), H330
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure (Category 1), H372
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



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Signal Word	Danger

Hazard statement(s)

H330	Fatal if inhaled.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	Cd
Molecular weight	:	112.41 g/mol
CAS-No.	:	7440-43-9
EC-No.	:	231-152-8

Component	Classification	Concentration
Cadmium		
	Acute Tox. 2; Muta. 2; Carc. 1B; Repr. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H330, H341, H350, H361, H372, H400, H410 M-Factor - Aquatic Acute: 1,000	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Consult a physician. Show this material safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Cadmium/cadmium oxides
Not combustible.

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

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6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Advice on protection against fire and explosion
Provide appropriate exhaust ventilation at places where dust is formed.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place.

Storage class
Storage class (TRGS 510): 6.1A: Combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

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Component	CAS-No.	Value	Control parameters	Basis
Cadmium	7440-43-9	TWA	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	0.3 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	0.6 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		PEL	0.005 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
	Remarks	Potential Occupational Carcinogen		
		TWA	0.01 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Suspected human carcinogen		
		TWA	0.002 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Suspected human carcinogen		
		PEL	0.005 mg/m3	OSHA Specifically Regulated Chemicals/Carcinogens
		OSHA specifically regulated carcinogen		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Cadmium	7440-43-9	cadmium	5 µg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Not critical			
		cadmium	5µg/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		Not critical			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact

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with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Foil Color: metallic
b)	Odor	odorless
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 320.9 °C (609.6 °F) - lit.
f)	Initial boiling point and boiling range	765 °C 1409 °F - lit.
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	1.3 hPa at 394 °C (741 °F)
l)	Vapor density	No data available
m)	Density	8.65 g/mL at 25 °C (77 °F) - lit.
	Relative density	8.622 °C - Regulation (EC) No. 440/2008, Annex, A.3
n)	Water solubility	2.3 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - slightly soluble
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances

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p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, acids

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Oral: No data available
LC50 Inhalation - Rat - male - 4 h - > 0.5638 mg/l - dust/mist

Remarks: (ECHA)
Dermal: No data available
No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
Suspected of causing genetic defects.

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Carcinogenicity
Presumed to have carcinogenic potential for humans

IARC: 1 - Group 1: Carcinogenic to humans (Cadmium)

NTP: Known - Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Cadmium)

OSHA: OSHA specifically regulated carcinogen (Cadmium)

Reproductive toxicity
Suspected of damaging the unborn child.
Suspected of damaging fertility.

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
No data available

11.2 Additional Information

Damage to the lungs., Kidney injury may occur., prolonged or repeated exposure can cause:, Vomiting, Diarrhea, Lung irritation
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 1.5 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Daphnia magna (Water flea) - 0.11 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to bacteria	static test NOEC - activated sludge - 0.2 mg/l - 3 h (OECD Test Guideline 209)

12.2 Persistence and degradability
The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential
Bioaccumulation: Oncorhynchus mykiss (rainbow trout) - 72 d - 1.27 µg/l(Cadmium)

Bioconcentration factor (BCF): 55

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12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Cadmium)
Reportable Quantity (RQ): 10 lbs
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 3288 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Cadmium)
Marine pollutant : yes

IATA
UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Cadmium)

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

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The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Cadmium	7440-43-9	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D006 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Cadmium	7440-43-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Cadmium	7440-43-9	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.Cadmium	7440-43-9	2009-02-01

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.7 Revision Date: 02/07/2023 Print Date: 07/13/2024

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SAFETY DATA SHEET

Creation Date 13-Sep-2013 **Revision Date** 24-Dec-2021 **Revision Number** 7

1. Identification

Product Name **Chromium**

Cat No. : **C318-500**

CAS No 7440-47-3
Synonyms Chrome

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements

Precautionary Statements
Storage
Store in a well-ventilated place. Keep container tightly closed
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Chromium	7440-47-3	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.

Inhalation Remove to fresh air. Get medical attention immediately if symptoms occur.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Most important symptoms and effects None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media No information available.

Unsuitable Extinguishing Media Carbon dioxide (CO2)

Flash Point No information available
Method - No information available

Autoignition Temperature No information available

Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Dust can form an explosive mixture with air. Do not allow run-off from fire-fighting to enter drains or water courses. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition. Fine dust dispersed in air may ignite.

Hazardous Combustion Products
Chromium oxide.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	2	1	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust

formation.

Environmental Precautions Should not be released into the environment. Do not allow material to contaminate ground water system. Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid ingestion and inhalation. Avoid contact with skin, eyes or clothing. Avoid dust formation.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere. Incompatible Materials. Strong oxidizing agents. Strong acids.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Chromium	TWA: 0.5 mg/m³	(Vacated) TWA: 1 mg/m³ TWA: 1 mg/m³	IDLH: 250 mg/m³ TWA: 0.5 mg/m³	TWA: 0.5 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection 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 and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection 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.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	1857 °C / 3374.6 °F
Boiling Point/Range	2642 °C / 4787.6 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available

Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Cr
Molecular Weight	52.00

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Sensitive to air.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation.

Incompatible Materials Strong oxidizing agents, Strong acids

Hazardous Decomposition Products Chromium oxide

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Chromium	7440-47-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Persistence and Degradability Insoluble in water May persist

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Chromium	7440-47-3	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Chromium	7440-47-3	X	-	231-157-5	X	X		X	X	KE-05970

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Chromium	7440-47-3	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Chromium	-	-	X	X

Clean Air Act

OSHA - Occupational Safety and Health Administration: Not applicable

CERCLA: Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Chromium	5000 lb 10 lb	-

California Proposition 65: This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Chromium	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security: This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade: No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Chromium	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Chromium	7440-47-3	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Chromium	7440-47-3	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	13-Sep-2013
Revision Date	24-Dec-2021
Print Date	24-Dec-2021
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Version 6.8
Revision Date 10/19/2022
Print Date 12/10/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : *cis*-1,2-Dichloroethylene

Product Number : D62004
Brand : Aldrich
Index-No. : 602-026-00-3
CAS-No. : 156-59-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



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Signal Word	Danger

Hazard statement(s)

H225	Highly flammable liquid and vapor.
H302 + H332	Harmful if swallowed or if inhaled.
H315	Causes skin irritation.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing mist or vapors.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	cis-Acetylene dichloride
Formula	:	$C_2H_2Cl_2$
Molecular weight	:	96.94 g/mol
CAS-No.	:	156-59-2
EC-No.	:	205-859-7
Index-No.	:	602-026-00-3

Component	Classification	Concentration
cis-Dichloroethylene		
	Flam. Liq. 2; Acute Tox. 4; Skin Irrit. 2; Aquatic Acute 3; Aquatic Chronic 3;	<= 100 %

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	H225, H302, H332, H315, H402, H412	

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. If breathing stops: mouth-to-mouth breathing or artificial respiration. Oxygen if necessary. Immediately call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

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5.4 Further information

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Handle and store under inert gas. Air and moisture sensitive. Light sensitive.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
cis-Dichloroethylene	156-59-2	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Eye irritation		

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
required

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: light yellow
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -80 °C (-112 °F) - lit.
f)	Initial boiling point and boiling range	60 °C 140 °F - lit.
g)	Flash point	6.0 °C (42.8 °F) - closed cup

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h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	1.284 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapors may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Violent reactions possible with:
Oxidizing agents

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 770 mg/kg
Remarks: (RTECS)
Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l - vapor

(Expert judgment)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
Dermal: No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Moderate skin irritation - 24 h
Remarks: (RTECS)

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: KV9420000
narcosis
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill sunfish) - 140 mg/l - 96 h Remarks: (ECOTOX Database)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,2-DICHLOROETHYLENE

IATA
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

SECTION 15: Regulatory information

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SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.8 Revision Date: 10/19/2022 Print Date: 12/10/2022

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Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH)

Ethylbenzene

Version number: GHS 1.0 Date of compilation: 2020-07-02

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Identification of the substance	**Ethylbenzene**
Registration number (REACH)	01-2119489370-35-xxxx
CAS number	100-41-4
Alternative name(s)	ethylbenzene
Article number	A0251309

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	General use

1.3 Details of the supplier of the safety data sheet

Chemos GmbH & Co. KG
Sonnenring 7
84032 Altdorf
Germany

Telephone: +49 871-966346-0
Telefax: +49 871-966346-13
e-mail: chemos@chemos.de
Website: http://www.chemos.de/

e-mail (competent person)	chemos@chemos.de

1.4 Emergency telephone number

Emergency information service	+49 89 1 92 40

Poison centre

Country	Name	Postal code/ city	Telephone	Telefax
United Kingdom	National Poison Information Centre Medical Toxicology Unit	SE14 5ER London	+44 171 635 91 91	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 (CLP)

Section	Hazard class	Category	Hazard class and category	Hazard statement
2.6	flammable liquid	2	Flam. Liq. 2	H225
3.1I	acute toxicity (inhal.)	4	Acute Tox. 4	H332
3.9	specific target organ toxicity - repeated exposure	2	STOT RE 2	H373
3.10	aspiration hazard	1	Asp. Tox. 1	H304
4.1C	hazardous to the aquatic environment - chronic hazard	2	Aquatic Chronic 2	H411

For full text of abbreviations: see SECTION 16.

The most important adverse physicochemical, human health and environmental effects

Delayed or immediate effects can be expected after short or long-term exposure. The product is combustible and can be ignited by potential ignition sources. Spillage and fire water can cause pollution of watercourses.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008 (CLP)

- Signal word danger

- Pictograms

GHS02, GHS07, GHS08, GHS09



- Hazard statements

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.

- Precautionary statements

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P301+P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P331	Do NOT induce vomiting.
P370+P378	In case of fire: Use sand, carbon dioxide or powder extinguisher to extinguish.
P403+P235	Store in a well-ventilated place. Keep cool.

2.3 Other hazards

Results of PBT and vPvB assessment

According to the results of its assessment, this substance is not a PBT or a vPvB.

SECTION 3: Composition/information on ingredients

3.1 Substances

Name of substance	Ethylbenzene
Identifiers	
REACH Reg. No	01-2119489370-35-xxxx
CAS No	100-41-4
EC No	202-849-4
Index No	601-023-00-4
Molecular formula	C8H10
Molar mass	106.2 $^{g}/_{mol}$

SECTION 4: First aid measures

4.1 Description of first aid measures

General notes

Do not leave affected person unattended. Remove victim out of the danger area. Keep affected person warm, still and covered. Take off immediately all contaminated clothing. In all cases of doubt, or when symptoms persist, seek medical advice. In case of unconsciousness place person in the recovery position. Never give anything by mouth.

Following inhalation

If breathing is irregular or stopped, immediately seek medical assistance and start first aid actions. Provide fresh air.

Following skin contact

Wash with plenty of soap and water.

Following eye contact

Remove contact lenses, if present and easy to do. Continue rinsing. Irrigate copiously with clean, fresh water for at least 10 minutes, holding the eyelids apart.

Following ingestion

Rinse mouth with water (only if the person is conscious). Do NOT induce vomiting.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms and effects are not known to date.

4.3 Indication of any immediate medical attention and special treatment needed

none

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Water spray, BC-powder, Carbon dioxide (CO_2)

Unsuitable extinguishing media

Water jet

5.2 Special hazards arising from the substance or mixture

In case of insufficient ventilation and/or in use, may form flammable/explosive vapour-air mixture. Solvent vapours are heavier than air and may spread along floors. Places which are not ventilated, e.g. unventilated below ground level areas such as trenches, conduits and shafts, are particularly prone to the presence of flammable substances or mixtures.

Hazardous combustion products

Carbon monoxide (CO), Carbon dioxide (CO_2)

5.3 Advice for firefighters

In case of fire and/or explosion do not breathe fumes. Co-ordinate firefighting measures to the fire surroundings. Do not allow firefighting water to enter drains or water courses. Collect contaminated firefighting water separately. Fight fire with normal precautions from a reasonable distance.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Remove persons to safety.

For emergency responders

Wear breathing apparatus if exposed to vapours/dust/spray/gases.

6.2 Environmental precautions

Keep away from drains, surface and ground water. Retain contaminated washing water and dispose of it. If substance has entered a water course or sewer, inform the responsible authority.

6.3 Methods and material for containment and cleaning up

Advice on how to contain a spill

Covering of drains

Advice on how to clean up a spill

Wipe up with absorbent material (e.g. cloth, fleece). Collect spillage: sawdust, kieselgur (diatomite), sand, universal binder

Appropriate containment techniques

Use of adsorbent materials.

Other information relating to spills and releases

Place in appropriate containers for disposal. Ventilate affected area.

6.4 Reference to other sections

Hazardous combustion products: see section 5. Personal protective equipment: see section 8. Incompatible materials: see section 10. Disposal considerations: see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Recommendations

- Measures to prevent fire as well as aerosol and dust generation

Use local and general ventilation. Avoidance of ignition sources. Keep away from sources of ignition - No smoking. Take precautionary measures against static discharge. Use only in well-ventilated areas. Due to danger of explosion, prevent leakage of vapours into cellars, flues and ditches. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools.

- Specific notes/details

Places which are not ventilated, e.g. unventilated below ground level areas such as trenches, conduits and shafts, are particularly prone to the presence of flammable substances or mixtures. Vapours are heavier than air, spread along floors and form explosive mixtures with air. Vapours may form explosive mixtures with air.

Advice on general occupational hygiene

Wash hands after use. Do not eat, drink and smoke in work areas. Remove contaminated clothing and protective equipment before entering eating areas. Never keep food or drink in the vicinity of chemicals. Never place chemicals in containers that are normally used for food or drink. Keep away from food, drink and animal feedingstuffs.

7.2 Conditions for safe storage, including any incompatibilities

Managing of associated risks

- Explosive atmospheres

Keep container tightly closed and in a well-ventilated place. Use local and general ventilation. Keep cool. Protect from sunlight.

- Flammability hazards

Keep away from sources of ignition - No smoking. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge. Protect from sunlight.

- Ventilation requirements

Keep any substance that emits harmful vapours or gases in a place that allows these to be permanently extracted. Use local and general ventilation. Ground/bond container and receiving equipment.

- Packaging compatibilities

Only packagings which are approved (e.g. acc. to ADR) may be used.

7.3 Specific end use(s)

See section 16 for a general overview.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limit values (Workplace Exposure Limits)

Country	Name of agent	CAS No	Identifier	TWA [ppm]	TWA [mg/m³]	STEL [ppm]	STEL [mg/m³]	Ceiling-C [ppm]	Ceiling-C [mg/m³]	Notation	Source
EU	ethylbenzene	100-41-4	IOELV	100	442	200	884				2000/39/EC
GB	ethylbenzene	100-41-4	WEL	100	441	125	552				EH40/2005

Notation

Ceiling-C	ceiling value is a limit value above which exposure should not occur
STEL	short-term exposure limit: a limit value above which exposure should not occur and which is related to a 15-minute period (unless otherwise specified)
TWA	time-weighted average (long-term exposure limit): measured or calculated in relation to a reference period of 8 hours time-weighted average (unless otherwise specified)

Human health values

Relevant DNELs and other threshold levels

Endpoint	Threshold level	Protection goal, route of exposure	Used in	Exposure time
DNEL	77 mg/m³	human, inhalatory	worker (industry)	chronic - systemic effects
DNEL	293 mg/m³	human, inhalatory	worker (industry)	acute - local effects
DNEL	180 mg/kg bw/day	human, dermal	worker (industry)	chronic - systemic effects

Environmental values

Relevant PNECs and other threshold levels

Endpoint	Threshold level	Organism	Environmental compartment	Exposure time
PNEC	0.1 mg/l	aquatic organisms	freshwater	short-term (single instance)
PNEC	0.01 mg/l	aquatic organisms	marine water	short-term (single instance)
PNEC	9.6 mg/l	aquatic organisms	sewage treatment plant (STP)	short-term (single instance)
PNEC	13.7 mg/kg	aquatic organisms	freshwater sediment	short-term (single instance)

Relevant PNECs and other threshold levels				
Endpoint	**Threshold level**	**Organism**	**Environmental compartment**	**Exposure time**
PNEC	1.37 $^{mg}/_{kg}$	aquatic organisms	marine sediment	short-term (single instance)
PNEC	2.68 $^{mg}/_{kg}$	terrestrial organisms	soil	short-term (single instance)

8.2 Exposure controls

Appropriate engineering controls

General ventilation.

Individual protection measures (personal protective equipment)

Eye/face protection

Wear eye/face protection.

Skin protection

- Hand protection

Wear suitable gloves. Chemical protection gloves are suitable, which are tested according to EN 374. Check leak-tightness/impermeability prior to use. In the case of wanting to use the gloves again, clean them before taking off and air them well. For special purposes, it is recommended to check the resistance to chemicals of the protective gloves mentioned above together with the supplier of these gloves.

- Other protection measures

Take recovery periods for skin regeneration. Preventive skin protection (barrier creams/ointments) is recommended. Wash hands thoroughly after handling.

Respiratory protection

In case of inadequate ventilation wear respiratory protection.

Environmental exposure controls

Use appropriate container to avoid environmental contamination. Keep away from drains, surface and ground water.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	liquid
Colour	various
Odour	characteristic

Other safety parameters

pH (value)	not determined
Melting point/freezing point	-94.9 °C at 101.3 kPa
Initial boiling point and boiling range	136.1 °C at 1,013 mbar
Flash point	23 °C at 1,013 hPa
Evaporation rate	not determined

Flammability (solid, gas)	not relevant, (fluid)
Explosive limits	not determined
Vapour pressure	9.52 mbar at 20 °C
Density	not determined
Vapour density	this information is not available
Relative density	information on this property is not available

Solubility(ies)

- Water solubility	0.2 $^{g}/_{l}$ at 25 °C

Partition coefficient

- n-octanol/water (log KOW)	3.6 (pH value: 7.84, 20 °C) (ECHA)
Auto-ignition temperature	430 °C at 101.3 kPa (ECHA) (auto-ignition temperature (liquids and gases))

Viscosity

- Kinematic viscosity	0.773 $^{mm^2}/_{s}$ at 20 °C
Explosive properties	none
Oxidising properties	none

9.2 Other information

Surface tension	71.2 $^{mN}/_{m}$ (23 °C) (ECHA)
Solvent content	100 %
Temperature class (EU, acc. to ATEX)	T2 (maximum permissible surface temperature on the equipment: 300°C)

SECTION 10: Stability and reactivity

10.1 Reactivity

Concerning incompatibility: see below "Conditions to avoid" and "Incompatible materials". It's a reactive substance. The mixture contains reactive substance(s). Risk of ignition.

If heated:

Risk of ignition

10.2 Chemical stability

See below "Conditions to avoid".

10.3 Possibility of hazardous reactions

No known hazardous reactions.

10.4 Conditions to avoid

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Hints to prevent fire or explosion

Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Take precautionary measures against static discharge.

10.5 Incompatible materials

Oxidisers

10.6 Hazardous decomposition products

Reasonably anticipated hazardous decomposition products produced as a result of use, storage, spill and heating are not known. Hazardous combustion products: see section 5.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Classification according to GHS (1272/2008/EC, CLP)

Acute toxicity

Harmful if inhaled.

GHS of the United Nations, annex 4: May be harmful if swallowed.

- Acute toxicity estimate (ATE)

Inhalation: vapour 11 $^{mg}/_{l}$/4h

Skin corrosion/irritation

Shall not be classified as corrosive/irritant to skin.

Serious eye damage/eye irritation

Shall not be classified as seriously damaging to the eye or eye irritant.

Respiratory or skin sensitisation

Shall not be classified as a respiratory or skin sensitiser.

Germ cell mutagenicity

Shall not be classified as germ cell mutagenic.

Carcinogenicity

Shall not be classified as carcinogenic.

Reproductive toxicity

Shall not be classified as a reproductive toxicant.

Specific target organ toxicity - single exposure

Shall not be classified as a specific target organ toxicant (single exposure).

Specific target organ toxicity - repeated exposure

May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard

May be fatal if swallowed and enters airways.

SECTION 12: Ecological information

12.1 Toxicity

Toxic to aquatic life with long lasting effects.

Aquatic toxicity (chronic)			
Endpoint	**Value**	**Species**	**Exposure time**
LC50	3.6 $^{mg}/_{l}$	aquatic invertebrates	7 d

12.2 Persistence and degradability

Data are not available.

12.3 Bioaccumulative potential

Data are not available.

n-octanol/water (log KOW)	3.6 (pH value: 7.84, 20 °C) (ECHA)
BCF	1 (ECHA)

12.4 Mobility in soil

Data are not available.

12.5 Results of PBT and vPvB assessment

Data are not available.

12.6 Other adverse effects

Data are not available.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Waste treatment-relevant information

Solvent reclamation/regeneration.

Sewage disposal-relevant information

Do not empty into drains. Avoid release to the environment. Refer to special instructions/safety data sheets.

Waste treatment of containers/packagings

It is a dangerous waste; only packagings which are approved (e.g. acc. to ADR) may be used. Completely emptied packages can be recycled. Handle contaminated packages in the same way as the substance itself.

Remarks

Please consider the relevant national or regional provisions. Waste shall be separated into the categories that can be handled separately by the local or national waste management facilities.

SECTION 14: Transport information

14.1	**UN number**	1175
14.2	**UN proper shipping name**	ETHYLBENZENE
14.3	**Transport hazard class(es)**	
	Class	3 (flammable liquids) (environmentally hazardous)
14.4	**Packing group**	II (substance presenting medium danger)
14.5	**Environmental hazards**	hazardous to the aquatic environment

14.6 Special precautions for user

Provisions for dangerous goods (ADR) should be complied within the premises.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code

The cargo is not intended to be carried in bulk.

Information for each of the UN Model Regulations

Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN)

UN number	1175
Proper shipping name	ETHYLBENZENE
Class	3
Classification code	F1
Packing group	II
Danger label(s)	3, fish and tree



Environmental hazards	yes (hazardous to the aquatic environment)
Excepted quantities (EQ)	E2
Limited quantities (LQ)	1 L
Transport category (TC)	2
Tunnel restriction code (TRC)	D/E
Hazard identification No	33
Emergency Action Code	3YE

International Maritime Dangerous Goods Code (IMDG)

UN number	1175
Proper shipping name	ETHYLBENZENE
Class	3
Marine pollutant	yes (hazardous to the aquatic environment)
Packing group	II
Danger label(s)	3, fish and tree



Special provisions (SP)	-
Excepted quantities (EQ)	E2
Limited quantities (LQ)	1 L
EmS	F-E, S-D
Stowage category	B

International Civil Aviation Organization (ICAO-IATA/DGR)

UN number	1175
Proper shipping name	Ethylbenzene
Class	3
Environmental hazards	yes (hazardous to the aquatic environment)
Packing group	II
Danger label(s)	3



Excepted quantities (EQ)	E2
Limited quantities (LQ)	1 L

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Relevant provisions of the European Union (EU)

Deco-Paint Directive (2004/42/EC)

VOC content	100 %

Directive on industrial emissions (VOCs, 2010/75/EU)

VOC content	100 %

National inventories

Country	Inventory	Status
AU	AICS	substance is listed
CA	DSL	substance is listed
CN	IECSC	substance is listed
EU	ECSI	substance is listed
EU	REACH Reg.	substance is listed
JP	CSCL-ENCS	substance is listed
KR	KECI	substance is listed
MX	INSQ	substance is listed
NZ	NZIoC	substance is listed
PH	PICCS	substance is listed
TR	CICR	substance is listed

Country	Inventory	Status
TW	TCSI	substance is listed
US	TSCA	substance is listed

Legend

AICS	Australian Inventory of Chemical Substances
CICR	Chemical Inventory and Control Regulation
CSCL-ENCS	List of Existing and New Chemical Substances (CSCL-ENCS)
DSL	Domestic Substances List (DSL)
ECSI	EC Substance Inventory (EINECS, ELINCS, NLP)
IECSC	Inventory of Existing Chemical Substances Produced or Imported in China
INSQ	National Inventory of Chemical Substances
KECI	Korea Existing Chemicals Inventory
NZIoC	New Zealand Inventory of Chemicals
PICCS	Philippine Inventory of Chemicals and Chemical Substances
REACH Reg.	REACH registered substances
TCSI	Taiwan Chemical Substance Inventory
TSCA	Toxic Substance Control Act

15.2 Chemical Safety Assessment

No Chemical Safety Assessment has been carried out for this substance.

SECTION 16: Other information

Abbreviations and acronyms

Abbr.	Descriptions of used abbreviations
2000/39/EC	Commission Directive establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC
ADN	Accord européen relatif au transport international des marchandises dangereuses par voies de navigation intérieures (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)
ADR	Accord européen relatif au transport international des marchandises dangereuses par route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
BCF	Bioconcentration factor
CAS	Chemical Abstracts Service (service that maintains the most comprehensive list of chemical substances)
Ceiling-C	Ceiling value
CLP	Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
DGR	Dangerous Goods Regulations (see IATA/DGR)
DNEL	Derived No-Effect Level
EC No	The EC Inventory (EINECS, ELINCS and the NLP-list) is the source for the seven-digit EC number, an identifier of substances commercially available within the EU (European Union)
EH40/2005	EH40/2005 Workplace exposure limits (http://www.nationalarchives.gov.uk/doc/open-government-licence/)
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances
EmS	Emergency Schedule
GHS	"Globally Harmonized System of Classification and Labelling of Chemicals" developed by the United Nations
IATA	International Air Transport Association

Abbr.	Descriptions of used abbreviations
IATA/DGR	Dangerous Goods Regulations (DGR) for the air transport (IATA)
ICAO	International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods Code
index No	The Index number is the identification code given to the substance in Part 3 of Annex VI to Regulation (EC) No 1272/2008
IOELV	Indicative occupational exposure limit value
LC50	Lethal Concentration 50%: the LC50 corresponds to the concentration of a tested substance causing 50 % lethality during a specified time interval
MARPOL	International Convention for the Prevention of Pollution from Ships (abbr. of "Marine Pollutant")
NLP	No-Longer Polymer
PBT	Persistent, Bioaccumulative and Toxic
PNEC	Predicted No-Effect Concentration
ppm	Parts per million
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RID	Règlement concernant le transport International ferroviaire des marchandises Dangereuses (Regulations concerning the International carriage of Dangerous goods by Rail)
STEL	Short-term exposure limit
TWA	Time-weighted average
VOC	Volatile Organic Compounds
vPvB	Very Persistent and very Bioaccumulative
WEL	Workplace exposure limit

Key literature references and sources for data

Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures. Regulation (EC) No. 1907/2006 (REACH), amended by 2015/830/EU.

Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN). International Maritime Dangerous Goods Code (IMDG). Dangerous Goods Regulations (DGR) for the air transport (IATA).

List of relevant phrases (code and full text as stated in chapter 2 and 3)

Code	Text
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.

Disclaimer

This information is based upon the present state of our knowledge. This SDS has been compiled and is solely intended for this product.

Material Safety Data Sheet
Iron

ACC# 11490

Section 1 - Chemical Product and Company Identification

MSDS Name: Iron
Catalog Numbers: S71953, S71953-1, S71953-2, S93268, I60-3, I60-500, I62-500
Synonyms: Iron Dust; Iron Metal; Iron Powder.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-89-6	IRON	>97	231-096-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: black to gray solid.
Warning! Flammable solid. May cause mechanical eye and skin irritation. May cause blood abnormalities. May cause lung damage. Inhalation of fumes may cause metal-fume fever. May cause cardiac disturbances. May cause liver damage.
Target Organs: Liver, respiratory system, cardiovascular system, pancreas.

Potential Health Effects

Eye: Exposure to particulates or solution may cause conjunctivitis, ulceration, and corneal abnormalities.
Skin: May cause skin irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Acute toxicity may include weakness, shock, cyanosis and acidosis. Delayed symptoms may include liver
Inhalation: Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause lung damage.
Chronic: Chronic exposure may lead to liver and lung damage. Repeated exposure may cause pancreatic damage, diabetes, and cardiac abnormalities.

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: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated

clothing and shoes. Get medical aid if irritation develops or persists.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. 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 if cough or other symptoms appear.
Notes to Physician: Treat symptomatically and supportively.
Antidote: The use of Deferoxamine as a chelating agent should be determined only by qualified medical personnel.

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. Combustion generates toxic fumes.
Extinguishing Media: Use only graphite powder, soda ash, powdered sodium chloride, or an appropriate metal-fire-extinguishing dry powder.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty conditions. Remove all sources of ignition.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. 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: Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
IRON	none listed	none listed	none listed

OSHA Vacated PELs: IRON: 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 impervious gloves.
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: black to gray
Odor: none reported
pH: Not available.
Vapor Pressure: 1 mm Hg @ 1787 deg C
Vapor Density: Not available.
Evaporation Rate: Negligible.
Viscosity: Not available.
Boiling Point: 2750 deg C
Freezing/Melting Point:1535 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density:7.86 @ 20°C
Molecular Formula: Fe
Molecular Weight:55.847

Section 10 - Stability and Reactivity

Chemical Stability: Decomposes when heated. Oxidizes when exposed to air.
Conditions to Avoid: Incompatible materials, moisture, exposure to air, excess heat.
Incompatibilities with Other Materials: Acetaldehyde, ammonium peroxodisulfate, chloroformamidinium, chloric acid, ammonium nitrate, halogens, dinitrogen tetroxide, nitryl fluoride, polystyrene, sodium acetylide, potassium dichromate, peroxyformic acid, nitryl fluoride, sulfuric acid, sodium carbide.
Hazardous Decomposition Products: Oxides of iron.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7439-89-6: NO4565500; NO8225000
LD50/LC50:
CAS# 7439-89-6:
Oral, rat: LD50 = 30 gm/kg;
.

Carcinogenicity:
CAS# 7439-89-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: No information reported.
Physical: No information available.
Other: None.

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:	METAL POWDERS, FLAMMABLE, N.O.S.	METAL POWDER FLAMMABLE NOS (IRON)
Hazard Class:	4.1	4.1
UN Number:	UN3089	UN3089
Packing Group:	II	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7439-89-6 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
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7439-89-6: immediate, fire.
Section 313 No chemicals are reportable under Section 313.
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.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
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# 7439-89-6 can be found on the following state right to know lists: California.

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:

Not available.

Risk Phrases:

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 7439-89-6: 0

Canada - DSL/NDSL

CAS# 7439-89-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B4, 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

Section 16 - Additional Information

MSDS Creation Date: 12/12/1997
Revision #4 Date: 11/06/2007

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.

Lead

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 12/15/2014 Revision date: 12/15/2014 Version: 1.1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Substance

CAS No : 7439-92-1

Formula : Pb

Synonyms : C.I. 77575, in massive state / elemental lead, in massive state / glover, in massive state

BIG no : 10073

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Solder
Battery: component
Construction
Electrodes

1.3. Details of the supplier of the safety data sheet

GSC International, Inc.
1747 N. Deffer Drive
Nixa,
MO 65714
United States of America

Tel: 417-374-7431
Fax: 417-374-7442
Email: info@gscinternationalinc.com

1.4. Emergency telephone number

Country	Organization/Company	Address	Emergency number
MEXICO	Servicio de Informacion Toxicologica Sintox	Tintoreto #32 Edif. a Desp. Col. Nochebuena Mixcoac México, D.F.	1 800 009 2800 +52 55 5611 2634 /+52 55 5598 9095
UNITED STATES OF AMERICA	American Association of Poison Control Centers		1-800-222-1222

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302
Acute Tox. 4 (Inhalation)	H332
Carc. 1B	H350
Repr. 1A	H360
STOT RE 2	H373
Aquatic Acute 1	H400
Aquatic Chronic 1	H410

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



GHS07 GHS08 GHS09

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H302+H332 - Harmful if swallowed or if inhaled
H350 - May cause cancer
H360 - May damage fertility or the unborn child
H373 - May cause damage to organs through prolonged or repeated exposure

H400 - Very toxic to aquatic life
H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (GHS-US) : P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust, fume
P264 - Wash hands thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P308+P313 - If exposed or concerned: Get medical advice/attention
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container to a licensed hazardous-waste disposal contractor or collection site except for empty clean containers which can be disposed of as non-hazardous waste

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS-US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Name	Product identifier	%	Classification (GHS-US)
Lead (Main constituent)	(CAS No) 7439-92-1	> 99,9	Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Inhalation), H332 Carc. 1B, H350 Repr. 1A, H360 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

4.1. Description of first aid measures

First-aid measures general : If you feel unwell, seek medical advice. IF exposed or concerned: Get medical advice/attention. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Not applicable. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after skin contact : Not applicable. Wash skin with plenty of water.

First-aid measures after eye contact : Not applicable. Rinse eyes with water as a precaution.

First-aid measures after ingestion : Not applicable. Rinse mouth. Call a poison center/doctor/physician if you feel unwell.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : No effects known.

Symptoms/injuries after skin contact : No effects known.

Symptoms/injuries after eye contact : No effects known.

Symptoms/injuries after ingestion : No effects known.

Chronic symptoms : No effects known.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Adapt extinguishing media to the environment.

Unsuitable extinguishing media : No unsuitable extinguishing media known.

5.2. Special hazards arising from the substance or mixture

Fire hazard : DIRECT FIRE HAZARD. Non combustible.

Explosion hazard	:	DIRECT EXPLOSION HAZARD. No data available on direct explosion hazard. INDIRECT EXPLOSION HAZARD. No data available on indirect explosion hazard.
Reactivity	:	On burning: formation of metallic fumes. Oxidizes on exposure to air.

5.3. Advice for firefighters

Precautionary measures fire	:	Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to heat: have neighborhood close doors and windows.
Firefighting instructions	:	Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting	:	Heat/fire exposure: compressed air/oxygen apparatus. Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Protective clothing. See "Material-Handling" to select protective clothing.
Emergency procedures	:	Mark the danger area. No naked flames.

6.1.2. For emergency responders

Protective equipment	:	Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Prevent soil and water pollution. Prevent spreading in sewers. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	:	Not applicable. Collect spillage.
Methods for cleaning up	:	Recover mechanically the product. Pick-up the material. Take collected spill to manufacturer/competent authority. Notify authorities if product enters sewers or public waters.
Other information	:	Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Meet the legal requirements. Do not discharge the waste into the drain. Handle unclean empty containers as full ones. Observe strict hygiene. Measure the concentration in the atmosphere. Carry out operations in the open/under local exhaust/ventilation or with respiratory protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust, fume. Use only outdoors or in a well-ventilated area. Take all necessary technical measures to avoid or minimize the release of the product on the workplace. Limit quantities of product at the minimum necessary for handling and limit the number of exposed workers. Provide local exhaust or general room ventilation. Wear personal protective equipment. Floors, walls and other surfaces in the hazard area must be cleaned regularly.
Hygiene measures	:	Separate working clothes from town clothes. Launder separately. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Does not require any specific or particular technical measures. Comply with applicable regulations.
Storage conditions	:	Store locked up. Store in a well-ventilated place. Keep cool.
Incompatible materials	:	Strong acids, strong bases and oxidation agents.
Heat-ignition	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: oxidizing agents. Strong acids. Strong bases.
Storage area	:	Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: closing. correctly labeled. meet the legal requirements. Secure fragile packaging in solid containers.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Lead (7439-92-1)		
ACGIH	ACGIH TWA (mg/m³)	0,05 mg/m³
ACGIH	Remark (ACGIH)	CNS & PNS impair
OSHA	Not applicable	

8.2. Exposure controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Ensure good ventilation of the work station.

Personal protective equipment : Protective goggles. Gloves.



Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: butyl rubber. PVC. GIVE LESS RESISTANCE: No data available. GIVE POOR RESISTANCE: No data available.

Hand protection : protective gloves.

Eye protection : Safety glasses.

Skin and body protection : Not required for normal conditions of use.

Respiratory protection : Wear respiratory protection.

Environmental exposure controls : Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid

Appearance : Metal.

Molecular mass : 207,20 g/mol

Color : White to blue-grey

Odor : Odorless

Odor threshold : No data available

pH : No data available

Relative evaporation rate (butyl acetate=1) : No data available

Melting point : 327 °C

Freezing point : No data available

Boiling point : 1740 °C

Flash point : Not applicable

Auto-ignition temperature : No data available

Decomposition temperature : No data available

Flammability (solid, gas) : No data available

Vapor pressure : < 0,1 hPa

Relative vapor density at 20 °C : No data available

Relative density : 11,3

Specific gravity / density : 11340 kg/m³

Solubility : insoluble in water. Substance sinks in water. Soluble in nitric acid. Insoluble in organic solvents. Water: < 0,1 g/100ml

Log Pow : 0,73 (Estimated value)

Log Kow : No data available

Viscosity, kinematic	:	Not applicable
Viscosity, dynamic	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Explosive limits	:	No data available

9.2. Other information

VOC content : Not applicable (inorganic)

SECTION 10: Stability and reactivity

10.1. Reactivity

On burning: formation of metallic fumes. Oxidizes on exposure to air.

10.2. Chemical stability

Unstable on exposure to air.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

No additional information available

10.5. Incompatible materials

Acids. Bases.

10.6. Hazardous decomposition products

Thermal decomposition generates : fume.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed. Inhalation: Harmful if inhaled.

Lead (\f)7439-92-1	
LD50 oral rat	> 2000 mg/kg body weight (Rat; Weight of evidence)
LD50 dermal rat	> 2000 mg/kg body weight (Rat; Experimental value; OECD 402: Acute Dermal Toxicity)
ATE US (oral)	500,000 mg/kg body weight
ATE US (gases)	4500,000 ppmV/4h
ATE US (vapors)	11,000 mg/l/4h
ATE US (dust, mist)	1,500 mg/l/4h
Additional information	Lead massive metal is not considered to be acutely toxic. It is not easily inhaled or ingested, and if it is accidentally ingested normally passes through the gastrointestinal system without significant absorption into the body. Lead is not easily absorbed through the skin.

Skin corrosion/irritation : Not classified
(Based on available data, the classification criteria are not met)

Serious eye damage/irritation : Not classified
(Based on available data, the classification criteria are not met)

Respiratory or skin sensitization : Not classified
(Based on available data, the classification criteria are not met)

Germ cell mutagenicity : Not classified
(Based on available data, the classification criteria are not met)

Carcinogenicity : May cause cancer.

Lead (7439-92-1)	
Additional information	There is some evidence that inorganic lead compounds may have a carcinogenic effect, and they have been classified by IARC as probably carcinogenic to humans. However, it is considered that this classification does not apply to lead in articles, given the very low bioavailability of metallic lead. Carcinogenicity studies of lead metal powder have been negative. Epidemiology studies of workers exposed to inorganic lead compounds have found a limited association with stomach cancer. IARC has concluded that lead metal is possibly carcinogenic to humans (Group aB).
IARC group	2B - Possibly carcinogenic to humans
National Toxicology Program (NTP) Status	3 - Reasonably anticipated to be Human Carcinogen

Reproductive toxicity : May damage fertility or the unborn child.

Specific target organ toxicity (single exposure) : Not classified

(Based on available data, the classification criteria are not met)

Specific target organ toxicity (repeated exposure) : May cause damage to organs through prolonged or repeated exposure.

Lead (7439-92-1)	
Additional information	Lead is a cumulative poison and may be absorbed into the body through ingestion or inhalation. Although inhalation and ingestion of lead in massive form are unlikely, poor hygiene practises may result in hand to mouth transfer which maybe significant over a prolonged period of time. Inorganic lead compounds have been documented in observational human studies to produce toxicity in multiple organ systems and body function including the haemotopoetic (blood) system, kidney function, reproductive function and the central nervous system.

Aspiration hazard : Not classified

(Based on available data, the classification criteria are not met)

Symptoms/injuries after inhalation : No effects known.

Symptoms/injuries after skin contact : No effects known.

Symptoms/injuries after eye contact : No effects known.

Symptoms/injuries after ingestion : No effects known.

Chronic symptoms : No effects known.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Dangerous for the environment. Very toxic to aquatic life with long lasting effects.

Ecology - air : Not dangerous for the ozone layer (Regulation (EC) No 1005/2009). Not included in the list of fluorinated greenhouse gases (Regulation (EC) No 842/2006). TA-Luft Klasse 5.2.2/II.

Ecology - water : No water pollutant (surface water). Maximum concentration in drinking water: 0.010 mg/l (lead) (Directive 98/83/EC). Highly toxic to aquatic organisms.

Lead (7439-92-1)	
LC50 fish 1	2,8 (0,44 - 542) mg/l (96h) Coughlan, D.J., S.P. Gloss, and J. Kubota 1986. Acute and Sub-Chronic Toxicity of Lead to the Early Life Stages of Small mouth Bass (Micropterus dolomieui). Water Air Soil Pollut. 28(3/4):265-275
EC50 Daphnia 1	4,46 (0,53 - 5,1) mg/l (48h) Govindarajan, S., C.P. Valsaraj, R. Mohan, V. Hariprasad, and R. Ramasubramanian 1993. Toxicity of Heavy Metals in Aquaculture Organisms: Penaeus indicus, Perna viridis, Artemia salina and Skeletonema costatum. Pollut.Res. 12(3):187-189

12.2. Persistence and degradability

Lead (7439-92-1)	
Persistence and degradability	Biodegradability: Not applicable. No (test)data available on mobility of the substance.
ThOD	Not applicable (inorganic)

12.3. Bioaccumulative potential

Lead (7439-92-1)	
Log Pow	0,73 (Estimated value)
Bioaccumulative potential	Low bioaccumulation potential (Log Kow < 4).

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Effect on ozone layer :

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Reuse or recycle following decontamination. Remove to an authorized dump (Class I). Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001).

Additional information : LWCA (the Netherlands): KGA category 05. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN3077 Environmentally hazardous substances, solid, n.o.s. Lead(7439-92-1), 9, III

UN-No.(DOT) : UN3077

Proper Shipping Name (DOT) : Environmentally hazardous substances, solid, n.o.s.
Lead(7439-92-1)

Department of Transportation (DOT) Hazard Classes : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140

Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)



DOT Symbols : G - Identifies PSN requiring a technical name

Packing group (DOT) : III - Minor Danger

DOT Special Provisions (49 CFR 172.102)	:	8 - A hazardous substance that is not a hazardous waste may be shipped under the shipping description “Other regulated substances, liquid or solid, n.o.s.”, as appropriate. In addition, for solid materials, special provision B54 applies. 146 - This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in 171.8 of this subchapter, or any hazard class as defined in Part 173 of this subchapter, if it is designated as environmentally hazardous by the Competent Authority of the country of origin, transit or destination. 335 - Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as “Environmentally hazardous substances, solid, n.o.s,” UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each transport unit must be leak-proof when used as bulk packaging. A112 - Notwithstanding the quantity limits shown in Column (9A) and (9B) for this entry, the following IBCs are authorized for transportation aboard passenger and cargo-only aircraft. Each IBC may not exceed a maximum net quantity of 1,000 kg: a. Metal: 11A, 11B, 11N, 21A, 21B and 21N b. Rigid plastics: 11H1, 11H2, 21H1 and 21H2 c. Composite with plastic inner receptacle: 11HZ1, 11HZ2, 21HZ1 and 21HZ2 d. Fiberboard: 11G e. Wooden: 11C, 11D and 11F (with inner liners) f. Flexible: 13H2, 13H3, 13H4, 13H5, 13L2, 13L3, 13L4, 13M1 and 13M2 (flexible IBCs must be sift-proof and water resistant or must be fitted with a sift-proof and water resistant liner). B54 - Open-top, sift-proof rail cars are also authorized. IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2). IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner. N20 - A 5M1 multi-wall paper bag is authorized if transported in a closed transport vehicle. T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2) TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	155
DOT Packaging Non Bulk (49 CFR 173.xxx)	:	213
DOT Packaging Bulk (49 CFR 173.xxx)	:	240
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	No limit
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	No limit
DOT Vessel Stowage Location	:	A - The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel.

Additional information

Other information : No supplementary information available.

ADR

No additional information available

Transport by sea

UN-No. (IMDG)	:	3077
Proper Shipping Name (IMDG)	:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Class (IMDG)	:	9 - Miscellaneous dangerous compounds
Packing group (IMDG)	:	III - substances presenting low danger

Air transport

UN-No.(IATA)	:	3077
Proper Shipping Name (IATA)	:	Environmentally hazardous substance, solid, n.o.s.
Class (IATA)	:	9 - Miscellaneous Dangerous Goods
Packing group (IATA)	:	III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Lead (7439-92-1)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313 Not listed on the United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	10 lb

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Repr. 1A	H360Df
Acute Tox. 4 (Inhalation)	H332
Acute Tox. 4 (Oral)	H302
STOT RE 2	H373
Aquatic Acute 1	H400
Aquatic Chronic 1	H410

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

Repr.Cat.1; R61
Repr.Cat.3; R62
Xn; R20/22
R33
N; R50/53

Full text of R-phrases: see section 16

15.2.2. National regulations

Lead (7439-92-1)
Listed on IARC (International Agency for Research on Cancer) Listed as carcinogen on NTP (National Toxicology Program)

15.3. US State regulations

No additional information available

SECTION 16: Other information

Revision date	:	12/15/2014

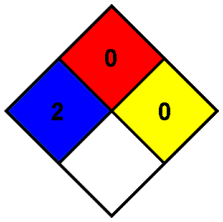
Full text of H-phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 1	Hazardous to the aquatic environment - Acute Hazard Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment - Chronic Hazard Category 1
Carc. 1B	Carcinogenicity Category 1B
Repr. 1A	Reproductive toxicity Category 1A
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H302	Harmful if swallowed
H332	Harmful if inhaled
H350	May cause cancer
H360	May damage fertility or the unborn child
H373	May cause damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects

NFPA health hazard : 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : * Chronic Hazard - Chronic (long-term) health effects may result from repeated overexposure

Flammability : 0 Minimal Hazard

Physical : 0 Minimal Hazard

Personal Protection : B

SDS US (GHS HazCom 2012)

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

SAFETY DATA SHEET

Version 6.4
Revision Date 08/05/2024
Print Date 08/06/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Magnesium

Product Number : 13112
Brand : Aldrich
Index-No. : 012-002-00-9
CAS-No. : 7439-95-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable solids (Category 1), H228
Self-heating chemicals (Category 1), H251
Chemicals which, in contact with water, emit flammable gases (Category 2), H261

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For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word Danger

Hazard Statements

H228	Flammable solid.
H251	Self-heating; may catch fire.
H261	In contact with water releases flammable gas.

Precautionary Statements

P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P223	Do not allow contact with water.
P231 + P232	Handle under inert gas. Protect from moisture.
P235 + P410	Keep cool. Protect from sunlight.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P280	Wear protective gloves/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P402 + P404	Store in a dry place. Store in a closed container.
P403 + P235	Store in a well-ventilated place. Keep cool.
P407	Maintain air gap between stacks/ pallets.
P420	Store away from other materials.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust
Vesicant.

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	Mg
Molecular weight	:	24.31 g/mol
CAS-No.	:	7439-95-4
EC-No.	:	231-104-6
Index-No.	:	012-002-00-9

No components need to be disclosed according to the applicable regulations.

For the full text of the H-Statements mentioned in this Section, see Section 16.

The life science business of Merck KGaA, Darmstadt, Germany
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SECTION 4: First aid measures

4.1 Description of first-aid measures
No data available

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Special powder against metal fire Cover with dry sand or cement.

Unsuitable extinguishing media
Foam Water

5.2 Special hazards arising from the substance or mixture
Magnesium oxide
Not combustible.

5.3 Advice for firefighters
No data available

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
For personal protection see section 8.

6.2 Environmental precautions
No data available

6.3 Methods and materials for containment and cleaning up
No data available

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

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7.2 Conditions for safe storage, including any incompatibilities
No data available

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Personal protective equipment

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Control of environmental exposure
Prevent product from entering drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder
b)	Odor	No data available
c)	Odor Threshold	No data available

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d)	pH	No data available
e)	Melting point/freezing point	Melting point/ range: 648 °C (1198 °F)
f)	Initial boiling point and boiling range	1,090 °C 1,994 °F
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	May form combustible dust concentrations in air.
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	1 hPa at 621 °C (1150 °F)
l)	Vapor density	No data available
m)	Density	1.74 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
No data available

10.3 Possibility of hazardous reactions
Risk of dust explosion.
Reacts with the following substances:
Acids
Bases

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Oxidizing agents

10.4 Conditions to avoid
Exposure to moisture. Exposure to air.

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Oral: No data available
Inhalation: No data available
Dermal: No data available

Skin corrosion/irritation
Remarks: No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: OM2100000

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burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, chills, Fever, fatigue, muscle pain, joint pain, rash, Anorexia.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods
No data available

SECTION 14: Transport information

DOT (US)
UN number: 1418 Class: 4.3 (4.2) Packing group: II
Proper shipping name: Magnesium, powder
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

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IMDG
UN number: 1418 Class: 4.3 (4.2) Packing group: II EMS-No: F-G, S-O
Proper shipping name: MAGNESIUM POWDER

IATA
UN number: 1418 Class: 4.3 (4.2) Packing group: II
Proper shipping name: Magnesium powder

SECTION 15: Regulatory information

CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards	:	Reactivity Hazard Chronic Health Hazard
SARA 313	:	This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

No components are subject to the Massachusetts Right to Know Act.

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

The ingredients of this product are reported in the following inventories:

TSCA	:	All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

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SECTION 16: Other information

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.4 Revision Date: 08/05/2024 Print Date: 08/06/2024

The life science business of Merck KGaA, Darmstadt, Germany
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SAFETY DATA SHEET

Version 6.10
Revision Date 03/04/2024
Print Date 07/13/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Manganese

Product Number : 463728
Brand : Aldrich
CAS-No. : 7439-96-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Chemicals which, in contact with water, emit flammable gases (Category 1), H260
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

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2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word Danger

Hazard Statements

H260	In contact with water releases flammable gases which may ignite spontaneously.
H411	Toxic to aquatic life with long lasting effects.

Precautionary Statements

P223	Do not allow contact with water.
P231 + P232	Handle under inert gas. Protect from moisture.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P402 + P404	Store in a dry place. Store in a closed container.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	Mn
Molecular weight	:	54.94 g/mol
CAS-No.	:	7439-96-5
EC-No.	:	231-105-1

Component	Classification	Concentration
Manganese		
	1; Aquatic Acute 2; Aquatic Chronic 2; H260, H401, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.

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If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
Water Foam

5.2 Special hazards arising from the substance or mixture
Manganese/manganese oxides
Combustible.
May not get in touch with: Water
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid inhalation of dusts. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains. Risk of explosion.

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6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Keep workplace dry. Do not allow product to come into contact with water.

Hygiene measures

Change contaminated clothing. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Keep away from heat and sources of ignition.
Never allow product to get in contact with water during storage.

Moisture sensitive.

Storage class

Storage class (TRGS 510): 4.3: Hazardous materials, which set free flammable gases upon contact with water

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Manganese	7439-96-5	C	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Ceiling limit is to be determined from breathing-zone air samples.		

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		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3 mg/m3	USA. NIOSH Recommended Exposure Limits
		C	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	0.2 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	3 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Not classifiable as a human carcinogen		
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Not classifiable as a human carcinogen		

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Wash hands after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Body Protection
protective clothing

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Respiratory protection
Recommended Filter type: Filter type P1
The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Color: gray
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 1,244 °C (2,271 °F) - lit.
f)	Initial boiling point and boiling range	1,962 °C 3,564 °F - lit.
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	7.3 g/mL at 25 °C (77 °F) - lit.
	Relative density	7.419 °C - Regulation (EC) No. 440/2008, Annex, A.3
n)	Water solubility	0.001 g/l at 20 °C (68 °F) - Regulation (EC) No. 440/2008, Annex, A.6 - slightly soluble
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p)	Autoignition temperature	No data available

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q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Avoid moisture.
Moisture.

10.5 Incompatible materials
acids, Halogens, Bases, Phosphorus, Sulfur oxides, Peroxides

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - > 2,000 mg/kg
(OECD Test Guideline 420)
LC50 Inhalation - Rat - male and female - 4 h - > 5.14 mg/l - dust/mist

(OECD Test Guideline 403)
Dermal: No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 4 h

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(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation - 72 h
(OECD Test Guideline 405)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: Chromosome aberration test in vitro
Test system: Human lymphocytes
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Red blood cells (erythrocytes)
Application Route: Oral
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
May cause reproductive disorders.

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

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Aspiration hazard
No data available

11.2 Additional Information

RTECS: OO9275000
Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - > 3.6 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 1.6 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Desmodesmus subspicatus (green algae) - 4.5 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - 1,000 mg/l - 3 h (OECD Test Guideline 209)
Toxicity to fish(Chronic toxicity)	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.17 - 15.61 mg/l - 28 d Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	static test NOEC - Ceriodaphnia dubia (water flea) - 1.7 mg/l - 8 d (OECD Test Guideline 211)

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

No data available

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12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 3208 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. (Manganese)

IATA
UN number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
IATA Passenger: Not permitted for transport

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

SARA 311/312 Hazards
Reactivity Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

SECTION 16: Other information

Further information
The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.
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Version: 6.10 Revision Date: 03/04/2024 Print Date: 07/13/2024

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SAFETY DATA SHEET

Creation Date 20-Aug-2014 **Revision Date** 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Mercury (Certified ACS)**

Cat No. : **M141-1LB; M141-6LB**

Synonyms Colloidal mercury; Hydrargyrum; Metallic mercury

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute Inhalation Toxicity - Vapors	Category 2
Reproductive Toxicity	Category 1B
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Central nervous system (CNS), Kidney.	

Label Elements

Signal Word
Danger

Hazard Statements
Fatal if inhaled
May damage the unborn child
Causes damage to organs through prolonged or repeated exposure



Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear respiratory protection
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING. Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Mercury	7439-97-6	100

4. First-aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately.

Most important symptoms and effects None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. approved class D extinguishers.

Unsuitable Extinguishing Media Water may be ineffective

Flash Point Not applicable
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Very toxic. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Keep product and empty container away from heat and sources of ignition. Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products
Mercury oxide. Toxic fumes.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required. No special precautions required. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Should not be released into the environment. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Pick up and transfer to properly labelled containers.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe mist/vapors/spray. Do not ingest. If swallowed then seek immediate medical assistance.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area. Keep in a dry place. Keep away from acids. Incompatible Materials. Strong oxidizing agents. Ammonia. Metals. Halogens.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Mercury	TWA: 0.025 mg/m³ Skin	(Vacated) TWA: 0.05 mg/m³ Ceiling: 0.1 mg/m³ (Vacated) STEL: 0.03 mg/m³ Skin (Vacated) Ceiling: 0.1 mg/m³	IDLH: 10 mg/m³ TWA: 0.05 mg/m³ Ceiling: 0.1 mg/m³	TWA: 0.025 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location. None under normal use conditions.

Personal Protective Equipment

Eye/face Protection 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 and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No special protective equipment required.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-38.87 °C / -38 °F
Boiling Point/Range	356.72 °C / 674.1 °F
Flash Point	Not applicable
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.002 mmHg @ 25 °C
Vapor Density	7.0
Specific Gravity	13.59 (H2O=1)
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	Hg
Molecular Weight	200.59

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat.

Incompatible Materials Strong oxidizing agents, Ammonia, Metals, Halogens

Hazardous Decomposition Products Mercury oxide, Toxic fumes

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Mercury	Not listed	Not listed	LC50 < 27 mg/m³ (Rat) 2 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Mercury	7439-97-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects May cause harm to the unborn child.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure Central nervous system (CNS) Kidney

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. May cause long-term adverse effects in the environment. Do not allow material to contaminate ground water system.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Mercury	Not listed	0.9 mg/L LC50 96h	Not listed	Not listed

		0.18 mg/L LC50 96h 0.16 mg/L LC50 96h 0.5 mg/L LC50 96h		

Persistence and Degradability Insoluble in water May persist

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Mercury - 7439-97-6	U151	-

14. Transport information

DOT

UN-No	UN2809
Proper Shipping Name	Mercury
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

TDG

UN-No	UN2809
Proper Shipping Name	Mercury
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

IATA

UN-No	UN2809
Proper Shipping Name	Mercury
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

IMDG/IMO

UN-No	UN2809
Proper Shipping Name	Mercury
Hazard Class	8
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Mercury	7439-97-6	X	ACTIVE	S;12C

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule.

TSCA 12(b) - Notices of Export

Component	CAS No	**TSCA 12(b)** - Notices of Export
Mercury	7439-97-6	Section 5

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Mercury	7439-97-6	X	-	231-106-7	X	X		X	X	KE-23117

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Mercury	7439-97-6	100	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Mercury	-	-	X	X

Clean Air Act

OSHA - Occupational Safety and Health Administration: Not applicable

CERCLA: This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Mercury	1 lb	-

California Proposition 65: This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Mercury	7439-97-6	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Mercury	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security: This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade: No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV -	REACH (1907/2006) - Annex XVII -	REACH Regulation (EC

	Substances Subject to Authorization	Restrictions on Certain Dangerous Substances	1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Mercury	-	Use restricted. See item 18[a]. (see link for restriction details) Use restricted. See item 30. (see link for restriction details) Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Mercury	7439-97-6	Listed	Not applicable	Not applicable	0.1% (Max. Conc.)

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Mercury	7439-97-6	Not applicable	Not applicable	X	Annex I - Y29

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 20-Aug-2014
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 26-Sep-2009 **Revision Date** 24-Dec-2021 **Revision Number** 6

1. Identification

Product Name **m-Xylene**

Cat No. : **AC180860000; AC180860010; AC180860025; AC180860100; AC180862500; AC18086N219**

CAS No 108-38-3
Synonyms 1,3-Dimethylbenzene

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 3
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
Harmful in contact with skin or if inhaled
May cause respiratory irritation



Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wash face, hands and any exposed skin thoroughly after handling
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
Call a POISON CENTER or doctor/physician if you feel unwell
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep cool
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS No	Weight %
m-Xylene	108-38-3	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs (by aspiration).

Ingestion Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms and effects None reasonably foreseeable. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media No information available

Flash Point 25 °C / 77 °F

Method - No information available

Autoignition Temperature 465 °C / 869 °F

Explosion Limits

Upper 7.0%

Lower 1.1%

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO_2).

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Flammables area. Keep away from heat, sparks and flame. Incompatible Materials. Strong oxidizing agents. Strong acids.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
m-Xylene	TWA: 100 ppm STEL: 150 ppm		IDLH: 900 ppm TWA: 100 ppm TWA: 435 mg/m³ STEL: 150 ppm STEL: 655 mg/m³	TWA: 100 ppm STEL: 150 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting equipment.

Personal Protective Equipment

Eye/face Protection 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 and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection 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.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-48 °C / -54.4 °F
Boiling Point/Range	138 - 139 °C / 280.4 - 282.2 °F
Flash Point	25 °C / 77 °F
Evaporation Rate	0.7

Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	7.0%
Lower	1.1%
Vapor Pressure	8 mbar @ 20 °C
Vapor Density	3.66
Specific Gravity	0.864
Solubility	Slightly soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	No information available
Viscosity	0.62 mPa.s at 20 °C
Molecular Formula	C8 H10
Molecular Weight	106.17

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents, Strong acids

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
m-Xylene	LD50 = 5 g/kg (Rat)	LD50 = 12.18 g/kg (Rabbit)	LC50 = 27124 mg/m³ (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin Irritating to eyes, respiratory system and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
m-Xylene	108-38-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Contains a substance which is:. Toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
m-Xylene	EC50: = 4.9 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: = 12.9 mg/L, 96h semi-static (Poecilia reticulata) LC50: = 8.4 mg/L, 96h semi-static (Oncorhynchus mykiss) LC50: 14.3 - 18 mg/L, 96h flow-through (Pimephales promelas)	EC50 = 0.0084 mg/L 24 h	EC50: 2.81 - 5.0 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability Persistence is unlikely

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility. Is not likely mobile in the environment due its low water solubility.

Component	log Pow
m-Xylene	3.2

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

TDG

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IATA

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IMDG/IMO

UN-No	UN1307
Proper Shipping Name	XYLENES
Hazard Class	3
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
m-Xylene	108-38-3	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
m-Xylene	108-38-3	X	-	203-576-3	X	X	X	X	X	KE-35428

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
m-Xylene	108-38-3	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
m-Xylene	X	-	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
m-Xylene	X		-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
m-Xylene	1000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know

Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
m-Xylene	X	X	X	X	-

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
m-Xylene	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
m-Xylene	108-38-3	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
m-Xylene	108-38-3	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 26-Sep-2009
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Version 6.6
Revision Date 03/02/2024
Print Date 07/13/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Nickel

Product Number : 266981
Brand : Aldrich
Index-No. : 028-002-01-4
CAS-No. : 7440-02-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin sensitization (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Lungs, H372

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Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word Danger

Hazard Statements

H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H372	Causes damage to organs (Lungs) through prolonged or repeated exposure if inhaled.
H412	Harmful to aquatic life with long lasting effects.

Precautionary Statements

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing must not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	Ni
Molecular weight	:	58.69 g/mol
CAS-No.	:	7440-02-0
EC-No.	:	231-111-4
Index-No.	:	028-002-01-4

Component	Classification	Concentration
nickel powder; [particle diameter < 1 mm]		
	Skin Sens. 1; Carc. 2;	<= 100 %

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	STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; H317, H351, H372, H402, H412	

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Nickel/nickel oxides
Not combustible.
Ambient fire may liberate hazardous vapours.

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5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

Handle and store under inert gas.

Storage class
Storage class (TRGS 510): 4.1B: Flammable solid hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
nickel powder; [particle diameter < 1 mm]	7440-02-0	TWA	1.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not suspected as a human carcinogen		
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.015 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
nickel powder; [particle diameter < 1 mm]	7440-02-0	Nickel	5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Nickel	30 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Body Protection
protective clothing

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Respiratory protection
Recommended Filter type: Filter type P3
The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Color: gray
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point: 1,455 °C (2,651 °F)
f)	Initial boiling point and boiling range	2,730 °C 4,946 °F
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	1 hPa at 1,810 °C (3,290 °F)
l)	Vapor density	No data available
m)	Density	8.9 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p)	Autoignition temperature	No data available
q)	Decomposition	No data available

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temperature

r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
acids, Oxidizing agents, Sulfur compounds, Hydrogen gas, Oxygen, Methanol, organic solvents, Aluminum, Fluorine, Ammonia

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - > 9,000 mg/kg
(OECD Test Guideline 401)
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation

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(OECD Test Guideline 405)

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available
Test Type: gene mutation test
Test system: Chinese hamster fibroblasts
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Micronucleus test
Test system: Chinese hamster fibroblasts
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 487
Result: negative

Carcinogenicity
Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

1 - Group 1: Carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

2B - Group 2B: Possibly carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

IARC: 2B - Group 2B: Possibly carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

1 - Group 1: Carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

2B - Group 2B: Possibly carcinogenic to humans (nickel powder; [particle diameter < 1 mm])

NTP: RAHC - Reasonably anticipated to be a human carcinogen (nickel powder; [particle diameter < 1 mm])

RAHC - Reasonably anticipated to be a human carcinogen (nickel powder; [particle diameter < 1 mm])

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Inhalation - Causes damage to organs through prolonged or repeated exposure.
- Lungs

Aspiration hazard
No data available

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11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 728 d - NOAEL (No observed adverse effect level) - 2.2 mg/kg - LOAEL (Lowest observed adverse effect level) - 6.7 mg/kg

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - 15.3 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Ceriodaphnia dubia (water flea) - 0.074 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test EC50 - Pseudokirchneriella subcapitata (green algae) - > 81.5 - 148 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test EC10 - Ceriodaphnia dubia (water flea) - > 2.8 - 53.6 µg/l - 7 d (US-EPA)

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

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SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)
UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powders, flammable, n.o.s.
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 3089 Class: 4.1 Packing group: II EMS-No: F-G, S-G
Proper shipping name: METAL POWDER, FLAMMABLE, N.O.S. (nickel powder; [particle diameter < 1 mm])
Marine pollutant : yes

IATA
UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powder, flammable, n.o.s.

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components
nickel powder; [particle diameter < 1 mm] CAS-No. Revision Date

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	7440-02-0	1993-02-16

California Prop. 65 Components

, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.nickel powder; [particle diameter < 1 mm]	CAS-No. 7440-02-0	Revision Date 2017-04-11

SECTION 16: Other information

Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.6 Revision Date: 03/02/2024 Print Date: 07/13/2024

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SAFETY DATA SHEET

Creation Date 15-Jun-2010 **Revision Date** 24-Dec-2021 **Revision Number** 8

1. Identification

Product Name **o-Xylene**

Cat No. : **O5081-4; O5081-4LC; O5081-500; O5081FB-200; DO5081-500**

CAS No 95-47-6
Synonyms 1,2-Dimethylbenzene (Certified)

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 3
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Liver.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
May cause damage to organs through prolonged or repeated exposure
Harmful in contact with skin or if inhaled



Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Wash face, hands and any exposed skin thoroughly after handling
Do not breathe dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Response
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
Call a POISON CENTER or doctor/physician if you feel unwell
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS No	Weight %
o-Xylene	95-47-6	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs (by aspiration).

Ingestion Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms and effects Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media Do not use a solid water stream as it may scatter and spread fire

Flash Point 31 °C / 87.8 °F

Method - No information available

Autoignition Temperature 465 °C / 869 °F

Explosion Limits

Upper 6.7 vol %

Lower 0.9 vol %

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO_2).

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Should not be released into the environment. See Section 12 for additional Ecological Information. Avoid release to the environment. Collect spillage. Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area. Incompatible Materials. Strong oxidizing agents. Strong acids.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
o-Xylene	TWA: 100 ppm STEL: 150 ppm		IDLH: 900 ppm TWA: 100 ppm TWA: 435 mg/m³ STEL: 150 ppm STEL: 655 mg/m³	TWA: 100 ppm STEL: 150 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting equipment.

Personal Protective Equipment

Eye/face Protection 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 and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection 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.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State Liquid
Appearance Colorless

Odor	aromatic
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	-25 °C / -13 °F
Boiling Point/Range	143 - 145 °C / 289.4 - 293 °F
Flash Point	31 °C / 87.8 °F
Evaporation Rate	0.7
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.7 vol %
Lower	0.9 vol %
Vapor Pressure	882 Pa @ 25 °C
Vapor Density	3.7
Specific Gravity	0.884
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	No information available
Viscosity	0.81 mPas @ 20°C
Molecular Formula	C8 H10
Molecular Weight	106.17

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents, Strong acids

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
o-Xylene	LD50 = 3608 mg/kg (Rat)	14100 mg/kg (Rabbit)	LC50 = 4330 ppm (Rat) 6 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
o-Xylene	95-47-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system Central nervous system (CNS)
STOT - repeated exposure Liver

Aspiration hazard Category 1

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not empty into drains. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
o-Xylene	EC50: = 4.7 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: 16.1 mg/L/96h (Lepomis macrochirus) LC50: 13 mg/L/24h (Carassius auratus)	EC50 = 0.0084 mg/L 24 h	EC50: 0.78 - 2.51 mg/L, 48h Static (Daphnia magna) EC50: 2.61 - 5.59 mg/L, 48h Flow through (Daphnia magna) EC50: = 3.2 mg/L, 48h (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
o-Xylene	3.12

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

TDG

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IATA

UN-No UN1307

Proper Shipping Name Xylenes
Hazard Class 3
Packing Group III

IMDG/IMO

UN-No UN1307
Proper Shipping Name Xylenes
Hazard Class 3
Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
o-Xylene	95-47-6	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
o-Xylene	95-47-6	X	-	202-422-2	X	X	X	X	X	KE-35429

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
o-Xylene	95-47-6	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
o-Xylene	X	-	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
o-Xylene	X		-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
o-Xylene	1000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
o-Xylene	X	X	X	X	-

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
o-Xylene	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
o-Xylene	95-47-6	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
o-Xylene	95-47-6	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 15-Jun-2010
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary SDS sections updated. 11. 16.

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information

relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 24-Mar-2014 **Revision Date** 28-Dec-2021 **Revision Number** 5

1. Identification

Product Name **p-Xylene**

Cat No. : **AC445680000, AC445680010, AC445680025, AC445681000**

CAS No 106-42-3
Synonyms 1,4-Dimethylbenzene

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 3
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS), Respiratory system.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements

Flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
Harmful in contact with skin or if inhaled



Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wash face, hands and any exposed skin thoroughly after handling
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
Call a POISON CENTER or doctor/physician if you feel unwell
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS No	Weight %
p-Xylene	106-42-3	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation Remove to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required. Risk of serious damage to the lungs (by aspiration).

Ingestion Aspiration hazard. Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms and effects Difficulty in breathing. . Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media CO_2, dry chemical, dry sand, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media Water may be ineffective

Flash Point 25 °C / 77 °F

Method - No information available

Autoignition Temperature 465 °C / 869 °F

Explosion Limits

Upper	7.0 vol %
Lower	1.1 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO_2). Hydrocarbons. Aldehydes.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes or clothing.

Environmental Precautions Avoid release to the environment. See Section 12 for additional Ecological Information. Do not flush into surface water or sanitary sewer system. Collect spillage.

Methods for Containment and Clean Up Remove all sources of ignition. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Use only under a chemical fume hood. Use spark-proof tools and explosion-proof equipment. Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Do not breathe mist/vapors/spray. Do not ingest. If swallowed then seek immediate medical assistance. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Use only non-sparking tools.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area. Incompatible Materials. Strong oxidizing agents. Strong acids. Strong bases.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
p-Xylene	TWA: 100 ppm STEL: 150 ppm		IDLH: 900 ppm TWA: 100 ppm TWA: 435 mg/m³ STEL: 150 ppm STEL: 655 mg/m³	TWA: 100 ppm STEL: 150 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Use only under a chemical fume hood. Use explosion-proof electrical/ventilating/lighting equipment. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection 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 and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection 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.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	13 °C / 55.4 °F

Boiling Point/Range	138 °C / 280.4 °F
Flash Point	25 °C / 77 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	7.0 vol %
Lower	1.1 vol %
Vapor Pressure	8 mbar @ 20 °C
Vapor Density	3.7 (Air = 1.0)
Specific Gravity	0.866
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	No information available
Viscosity	0.648 mPa.s (20°C)
Molecular Formula	C8 H10
Molecular Weight	106.17

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents, Strong acids, Strong bases

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Hydrocarbons, Aldehydes

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
p-Xylene	LD50 = 4029 mg/kg (Rat)	LD50 = 12126 mg/kg (Rabbit)	LC50 = 4740 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes, respiratory system and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
p-Xylene	106-42-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects Developmental effects have occurred in experimental animals.

Teratogenicity Teratogenic effects have occurred in experimental animals.

STOT - single exposure Central nervous system (CNS) Respiratory system
STOT - repeated exposure None known

Aspiration hazard Category 1

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Do not empty into drains. The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Contains a substance which is:. Toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
p-Xylene	EC50: = 3.2 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: = 8.8 mg/L, 96h semi-static (Poecilia reticulata) LC50: = 2.6 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 2.6 mg/L, 96h (Oncorhynchus mykiss) LC50: 7.2 - 9.9 mg/L, 96h static (Pimephales promelas)	EC50 = 5.7 mg/L 30 min	EC50: 3.55 - 6.31 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

Component	log Pow
p-Xylene	3.15

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

TDG

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IATA

UN-No	UN1307
Proper Shipping Name	XYLENES
Hazard Class	3
Packing Group	III

IMDG/IMO

UN-No	UN1307
Proper Shipping Name	XYLENES
Hazard Class	3
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
p-Xylene	106-42-3	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
p-Xylene	106-42-3	X	-	203-396-5	X	X	X	X	X	KE-35430

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
p-Xylene	106-42-3	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
p-Xylene	X	-	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
p-Xylene	X		-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs

p-Xylene	100 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
p-Xylene	X	X	X	X	-

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Moderate risk, Grade 2

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
p-Xylene	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
p-Xylene	106-42-3	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
p-Xylene	106-42-3	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 24-Mar-2014
Revision Date 28-Dec-2021
Print Date 28-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Version 6.10
Revision Date 08/07/2024
Print Date 08/08/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Thallium

Product Number : 277932
Brand : Aldrich
Index-No. : 081-001-00-3
CAS-No. : 7440-28-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 2), H300
Acute toxicity, Inhalation (Category 2), H330
Specific target organ toxicity - repeated exposure (Category 2), H373

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Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (Category 4), H413

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word Danger

Hazard Statements

H300 + H330	Fatal if swallowed or if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H402	Harmful to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary Statements

P260	Do not breathe dust.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P284	Wear respiratory protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P314	Get medical advice/ attention if you feel unwell.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	Tl
Molecular weight	:	204.38 g/mol
CAS-No.	:	7440-28-0
EC-No.	:	231-138-1
Index-No.	:	081-001-00-3

Component	Classification	Concentration
Thallium		
	Acute Tox. 2; STOT RE 2; Aquatic Acute 3; Aquatic Chronic 4; H300, H330, H373, H402, H413	<= 100 %

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For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures
No data available

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media
No data available

5.2 Special hazards arising from the substance or mixture
thallium oxides
Not combustible.

5.3 Advice for firefighters
No data available

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
For personal protection see section 8.

6.2 Environmental precautions
No data available

6.3 Methods and materials for containment and cleaning up
No data available

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

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7.2 Conditions for safe storage, including any incompatibilities
No data available

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Thallium	7440-28-0	TWA	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation		
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Danger of cutaneous absorption		
		TWA	0.1 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		PEL	0.1 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls
No data available

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: granular Color: light gray
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/ range: 303 °C (577 °F) - lit.
f)	Initial boiling point and boiling range	1,457 °C 2,655 °F - lit.
g)	Flash point	()Not applicable

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h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	The product is not flammable.
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	No data available
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
No data available

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Air sensitive.

10.5 Incompatible materials
Strong acids, Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 5.1 mg/kg
(Expert judgment)
Oral: No data available
Acute toxicity estimate Inhalation - 4 h - 0.051 mg/l - dust/mist

(Expert judgment)
Dermal: No data available
No data available

Skin corrosion/irritation
Remarks: No data available

Serious eye damage/eye irritation
Remarks: No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
Possible risk of congenital malformation in the fetus.
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard
No data available

11.2 Additional Information

RTECS: XG3425000
The most characteristic symptom of thallium exposure is alopecia (loss of hair). Cutaneous effects may include dry, scaly skin and impairment of nail growth often resulting in the appearance of crescent-shaped strips across fingernails and toenails (Mees' line). Other symptoms in acute poisoning relate chiefly to the gastrointestinal tract, nervous system, skin, eyes, and cardiovascular system. Acute poisoning results in swelling of the feet and legs, arthralgia, vomiting, insomnia, hyperesthesia and paresthesia of the hands and feet,

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mental confusion, polyneuritis with severe pain in the legs and loins, partial paralysis of the legs, angina-like pains, nephritis, wasting and weakness, and lymphocytosis and eosinophilia. In chronic poisoning, central and peripheral nervous system abnormalities may persist including ataxia, tremor, incoordination, paralysis of extremities, endocrine disorders, memory loss, and psychoses may develop., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Cyprinodon variegatus (sheepshead minnow) - 21.0 mg/l - 96.0 h
	mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 14.0 mg/l - 96.0 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods
No data available

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SECTION 14: Transport information

DOT (US)

UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Thallium)
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3288 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Thallium)

IATA

UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Thallium)

SECTION 15: Regulatory information

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Thallium	7440-28-0	1000	1000

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Acute Health Hazard
Chronic Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

Thallium 7440-28-0 >= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

Thallium 7440-28-0

Pennsylvania Right To Know

Thallium 7440-28-0

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

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Product does not contain any listed chemicals

The ingredients of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16: Other information

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.10 Revision Date: 08/07/2024 Print Date: 08/08/2024

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SAFETY DATA SHEET

Version 6.13
Revision Date 08/10/2021
Print Date 06/18/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Toluene

Product Number : 244511
Brand : Sigma-Aldrich
Index-No. : 601-021-00-3
CAS-No. : 108-88-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 2), Central nervous system, H373
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

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Pictogram	
Signal word	Danger

Hazard statement(s)

H225	Highly flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs (Central nervous system) through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

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SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_7H_8
Molecular weight	:	92.14 g/mol
CAS-No.	:	108-88-3
EC-No.	:	203-625-9
Index-No.	:	601-021-00-3

Component	Classification	Concentration
Toluene		
	Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H315, H361, H336, H373, H304, H401, H412 Concentration limits: 20 %: STOT SE 3, H336;	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures

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Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Handle and store under inert gas.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Toluene	108-88-3	TWA	100 ppm 375 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	150 ppm 560 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z37.12-1967		
		CEIL	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		Peak	500 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Visual impairment Female reproductive Pregnancy loss 2019 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

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		TWA	100 ppm 375 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 560 mg/m3	USA. NIOSH Recommended Exposure Limits

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Toluene	108-88-3	Toluene	0.02 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Toluene	0.03 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

Derived No Effect Level (DNEL)

Application Area	Routes of exposure	Health effect	Value
Workers	Inhalation	Acute systemic effects	384 mg/m3
Workers	Inhalation	Acute local effects	384 mg/m3
Workers	Skin contact	Long-term systemic effects	384mg/kg BW/d
Workers	Inhalation	Long-term systemic effects	192 mg/m3
Workers	Inhalation	Long-term local effects	192 mg/m3
Consumers	Inhalation	Acute systemic effects	226 mg/m3
Consumers	Inhalation	Acute local effects	226 mg/m3
Consumers	Skin contact	Long-term systemic effects	226mg/kg BW/d
Consumers	Inhalation	Long-term systemic effects	56.5 mg/m3
Consumers	Ingestion	Long-term systemic effects	8.13mg/kg BW/d

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	2.89 mg/kg
Sea water	0.68 mg/l
Fresh water	0.68 mg/l
Sea sediment	16.39 mg/kg
Fresh water sediment	16.39 mg/kg
Sewage treatment plant	13.61 mg/l
Aquatic intermittent release	0.68 mg/l

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
b)	Odor	benzene-like
c)	Odor Threshold	0.2 ppm
d)	pH	Not applicable
e)	Melting point/freezing point	Melting point/range: -93 °C (-135 °F)
f)	Initial boiling point and boiling range	110 - 111 °C 230 - 232 °F
g)	Flash point	4.0 °C (39.2 °F) - c.c.
h)	Evaporation rate	No data available

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i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 7.1 %(V) Lower explosion limit: 1.2 %(V)
k)	Vapor pressure	30.88 hPa at 21.1 °C (70.0 °F)
l)	Vapor density	3.18
m)	Density	0.865 g/mL at 25 °C (77 °F)
	Relative density	No data available
n)	Water solubility	0.58 g/l at 25 °C (77 °F) - partly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 2.73 at 20 °C (68 °F) - Bioaccumulation is not expected.
p)	Autoignition temperature	535.0 °C (995.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Conductivity	< 0.01 µS/cm
Surface tension	27.73 mN/m at 0.516g/l at 25 °C (77 °F)
Relative vapor density	3.18

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.
Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Risk of explosion with:
fuming sulfuric acid
Nitric acid
silver
perchlorates
nitrogen dioxide
nonmetallic halides
acetic acid
halogen-halogen compounds
uranium hexafluoride
organic nitro compounds

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Violent reactions possible with:
Strong acids
Strong oxidizing agents
sulfur
with
Heat.

10.4 Conditions to avoid
Warming.
Warming.

10.5 Incompatible materials
rubber, various plastics

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - 5,580 mg/kg
(Tested according to Directive 92/69/EEC.)
LC50 Inhalation - Rat - male and female - 4 h - 25.7 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - > 5,000 mg/kg
Remarks: (ECHA)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: irritating - 4 h
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: slight irritation
(OECD Test Guideline 405)

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(Regulation (EC) No. 440/2008, Annex, B.6)

Germ cell mutagenicity
Test Type: In vitro mammalian cell gene mutation test
Test system: Mouse lymphoma test
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Ames test
Test system: S. typhimurium
Metabolic activation: with and without metabolic activation
Method: Mutagenicity (Salmonella typhimurium - reverse mutation assay)
Result: negative

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Test Type: Chromosome aberration test
Species: Rat
Cell type: Bone marrow
Application Route: i.p.

Result: negative
Remarks: (ECHA)

Carcinogenicity
No data available

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
Suspected of damaging the unborn child.

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness. - Central nervous system

Specific target organ toxicity - repeated exposure
May cause damage to organs through prolonged or repeated exposure. - Central nervous system

Aspiration hazard
Aspiration hazard, Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

RTECS: XS5250000
Drowsiness, irritant effects, Dizziness, Convulsions, Headache, Nausea, Vomiting, Circulatory collapse, somnolence, inebriation, Unconsciousness, respiratory arrest, CNS disorders, respiratory paralysis, death
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Oncorhynchus kisutch (coho salmon) - 5.5 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Ceriodaphnia dubia (water flea) - 3.78 mg/l - 48 h (US-EPA)
Toxicity to bacteria	static test EC50 - Bacteria - 84 mg/l - 24 h

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Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 20 d
Result: 86 % - Readily biodegradable.
Remarks: (IUCLID)

12.3 Bioaccumulative potential

Bioaccumulation Leuciscus idus (Golden orfe) - 3 d
- 0.05 mg/l(Toluene)

Bioconcentration factor (BCF): 90

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1294 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: TOLUENE

IATA

UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene

SECTION 15: Regulatory information

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SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.13 Revision Date: 08/10/2021 Print Date: 06/18/2022

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SAFETY DATA SHEET

Version 6.15
Revision Date 08/06/2024
Print Date 08/07/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Zinc

Product Number : 209988
Brand : Aldrich
Index-No. : 030-001-01-9
CAS-No. : 7440-66-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Combustible dust,
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

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For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word Warning

Hazard Statements

May form combustible dust concentrations in air.

H410 Very toxic to aquatic life with long lasting effects.

Precautionary Statements

P273 Avoid release to the environment.

P391 Collect spillage.

P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula : Zn
Molecular weight : 65.39 g/mol
CAS-No. : 7440-66-6
EC-No. : 231-175-3
Index-No. : 030-001-01-9

Component	Classification	Concentration
zinc powder, zinc dust stabilized		
	Aquatic Acute 1; Aquatic Chronic 1; H400, H410 M-Factor - Aquatic Acute: 1 M-Factor - Aquatic Chronic: 1	<= 100 %

Zinc oxide		
	Aquatic Acute 1; Aquatic Chronic 1; H400, H410 M-Factor - Aquatic Acute: 1 M-Factor - Aquatic Chronic: 1	>= 1 - < 5 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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SECTION 4: First aid measures

4.1 Description of first-aid measures
No data available

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Special powder against metal fire Sand Cement

Unsuitable extinguishing media
Water Foam

5.2 Special hazards arising from the substance or mixture
Zinc/zinc oxides
Combustible.

5.3 Advice for firefighters
No data available

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
For personal protection see section 8.

6.2 Environmental precautions
No data available

6.3 Methods and materials for containment and cleaning up
No data available

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

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7.2 Conditions for safe storage, including any incompatibilities

Handle and store under inert gas. Air and moisture sensitive.

Storage class
Storage class (TRGS 510): 11: Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

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Component	CAS-No.	Value	Control parameters	Basis
Zinc oxide	1314-13-2	TWA	2 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		STEL	10 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits
		C	15 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	15 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	10 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Personal protective equipment

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

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data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Control of environmental exposure
Prevent product from entering drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Dust Color: dark gray
b)	Odor	odorless
c)	Odor Threshold	Not applicable
d)	pH	Not applicable
e)	Melting point/freezing point	Melting point/ range: 420 °C (788 °F) - lit.
f)	Initial boiling point and boiling range	907 °C 1665 °F - lit.
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	May form combustible dust concentrations in air.
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	1.33 hPa at 487 °C (909 °F)
l)	Vapor density	No data available
m)	Density	7.133 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	6.922 °C
n)	Water solubility	0.0001 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - slightly soluble
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p)	Autoignition temperature	does not ignite
q)	Decomposition	No data available

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temperature

r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
No data available
Contains the following stabilizer(s):
Zinc oxide (<=33 %)

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Acids and bases

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 2,500 mg/kg
(Calculation method)
LD50 Oral - Rat - male and female - > 2,000 mg/kg (zinc powder, zinc dust stabilized)
(OECD Test Guideline 401)
Acute toxicity estimate Inhalation - 4 h - 5.41 mg/l - dust/mist(Calculation method)

LC50 Inhalation - Rat - male and female - 4 h - > 5.41 mg/l - dust/mist
(zinc powder, zinc dust stabilized)
(OECD Test Guideline 403)
Acute toxicity estimate Dermal - > 5,000 mg/kg
(Calculation method)
Dermal: No data available

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Skin corrosion/irritation
Skin - Rabbit (zinc powder, zinc dust stabilized)
Result: No skin irritation - 5 d
Remarks: (in analogy to similar products)
(ECHA)
The value is given in analogy to the following substances: Zinc oxide

Serious eye damage/eye irritation
Eyes - Rabbit (zinc powder, zinc dust stabilized)
Result: No eye irritation - 24 h
(OECD Test Guideline 405)

Respiratory or skin sensitization
Maximization Test - Guinea pig (zinc powder, zinc dust stabilized)
Result: negative
(OECD Test Guideline 406)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: Zinc oxide

Germ cell mutagenicity
Test Type: Ames test
(zinc powder, zinc dust stabilized)
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: Zinc sulphateTest Type: In vitro mammalian cell gene mutation test
(zinc powder, zinc dust stabilized)
Test system: mouse lymphoma cells
Metabolic activation: without metabolic activation
Result: negative
Remarks: (in analogy to similar products)
(ECHA)
The value is given in analogy to the following substances: zinc chlorideTest Type: Chromosome aberration test in vitro
(zinc powder, zinc dust stabilized)
Test system: Other cell types
Metabolic activation: with and without metabolic activation
Result: negative
Remarks: (in analogy to similar products)
(ECHA)
The value is given in analogy to the following substances: zinc chloride (zinc powder, zinc dust stabilized)
Test Type: Micronucleus test
Species: Mouse
Cell type: Red blood cells (erythrocytes)
Application Route: Intraperitoneal

Result: negative
Remarks: (in analogy to similar products)
(ECHA)

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The value is given in analogy to the following substances: Zinc sulphate

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 31.52 mg/kg - LOAEL (Lowest observed adverse effect level) - 53.8 mg/kg
(zinc powder, zinc dust stabilized)
RTECS: ZG8600000
Effects due to ingestion may include:, chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness, Contact with eyes or skin may cause:, Irritation (zinc powder, zinc dust stabilized)
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. (zinc powder, zinc dust stabilized)

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - other fish - 0.439 mg/l - 96 h (zinc powder, zinc dust stabilized) Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Ceriodaphnia dubia (water flea) - 0.155 mg/l - 48 h (zinc powder, zinc dust stabilized) (US-EPA)
Toxicity to algae	static test NOEC - Pseudokirchneriella subcapitata (green algae) - 0.05 mg/l - 3 d (zinc powder, zinc dust stabilized) (OECD Test Guideline 201)
Toxicity to bacteria	static test NOEC - activated sludge - 0.1 mg/l - 4 h (zinc powder, zinc dust stabilized)

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	(ISO 9509) Remarks: (in analogy to similar products)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - other fish - 0.169 mg/l - 30 d (zinc powder, zinc dust stabilized) Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test NOEC - Daphnia magna (Water flea) - 0.100 mg/l - 3 Weeks (zinc powder, zinc dust stabilized) Remarks: (ECHA)

12.2 Persistence and degradability
The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential
Substance is not persistent, bioaccumulative, and toxic (PBT).

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods
No data available

SECTION 14: Transport information

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (zinc powder, zinc dust stabilized, Zinc oxide)
Reportable Quantity (RQ): 1030 lbs
Poison Inhalation Hazard: No

IMDG

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UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (zinc powder, zinc dust stabilized, Zinc oxide)
Marine pollutant : yes
Marine pollutant : no

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (zinc powder, zinc dust stabilized, Zinc oxide)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

SECTION 15: Regulatory information

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
zinc powder, zinc dust stabilized	7440-66-6	1000	1030

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : No SARA Hazards

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

zinc powder, zinc dust stabilized	7440-66-6	>= 90 - <= 100 %
Zinc oxide	1314-13-2	>= 1 - < 5 %

US State Regulations

Massachusetts Right To Know

zinc powder, zinc dust stabilized 7440-66-6
Zinc oxide 1314-13-2

Pennsylvania Right To Know

zinc powder, zinc dust stabilized 7440-66-6
Zinc oxide 1314-13-2

Maine Chemicals of High Concern

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Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

The ingredients of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

The following substance(s) is/are subject to TSCA 12(b) export notification requirements:
zinc powder, zinc dust stabilized 7440-66-6

SECTION 16: Other information

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.15 Revision Date: 08/06/2024 Print Date: 08/07/2024

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Appendix C – Decontamination Procedures

Sample Decontamination Procedures for Three Typical Levels of Protection[a]

F.S.O.P. No. 7

Process: DECONTAMINATION PROCEDURES

INTRODUCTION

1.1 The objective of these procedures is to minimize the risk of exposure to hazardous substances. These procedures were derived from the U.S. Environmental Protection Agency, Office of Emergency and Remedial Response's (OERR), "Interim Standard Operating Safety Guides (revised Sep. 82)". This version of the guides is in a format that is more appropriate for use in the field.

1.2 Protective equipment must be worn by personnel when response activities involve known or suspected hazardous substances. The procedures for decontaminating personnel upon leaving the contaminated area are addressed for each of the EPA, OERR designated levels of protection. The procedures given are for the maximum and minimum amount of decontamination used for each level of protection.

1.3 The maximum decontamination procedures for all levels of protection consist of specific activities at nineteen stations. Each station emphasizes an important aspect of decontamination. When establishing a decontamination line, each aspect should be incorporated separately or combined with other aspects into a procedure with fewer steps (such as the Minimum Decontamination Procedures).

1.4 Decontamination lines are site specific since they are dependent upon the types of contamination and the type of work activities on site. A cooling station is sometimes necessary within the decontamination line during hot weather. It is usually a location in a shaded area in which the wind can help to cool personnel. In addition, site conditions may permit the use of cooling devices such as cool water hose, ice packs, cool towels, etc. When the decontamination line is no longer required, contaminated wash and rinse solutions and contaminated articles must be contained and disposed of as hazardous wastes in compliance with state and federal regulations.

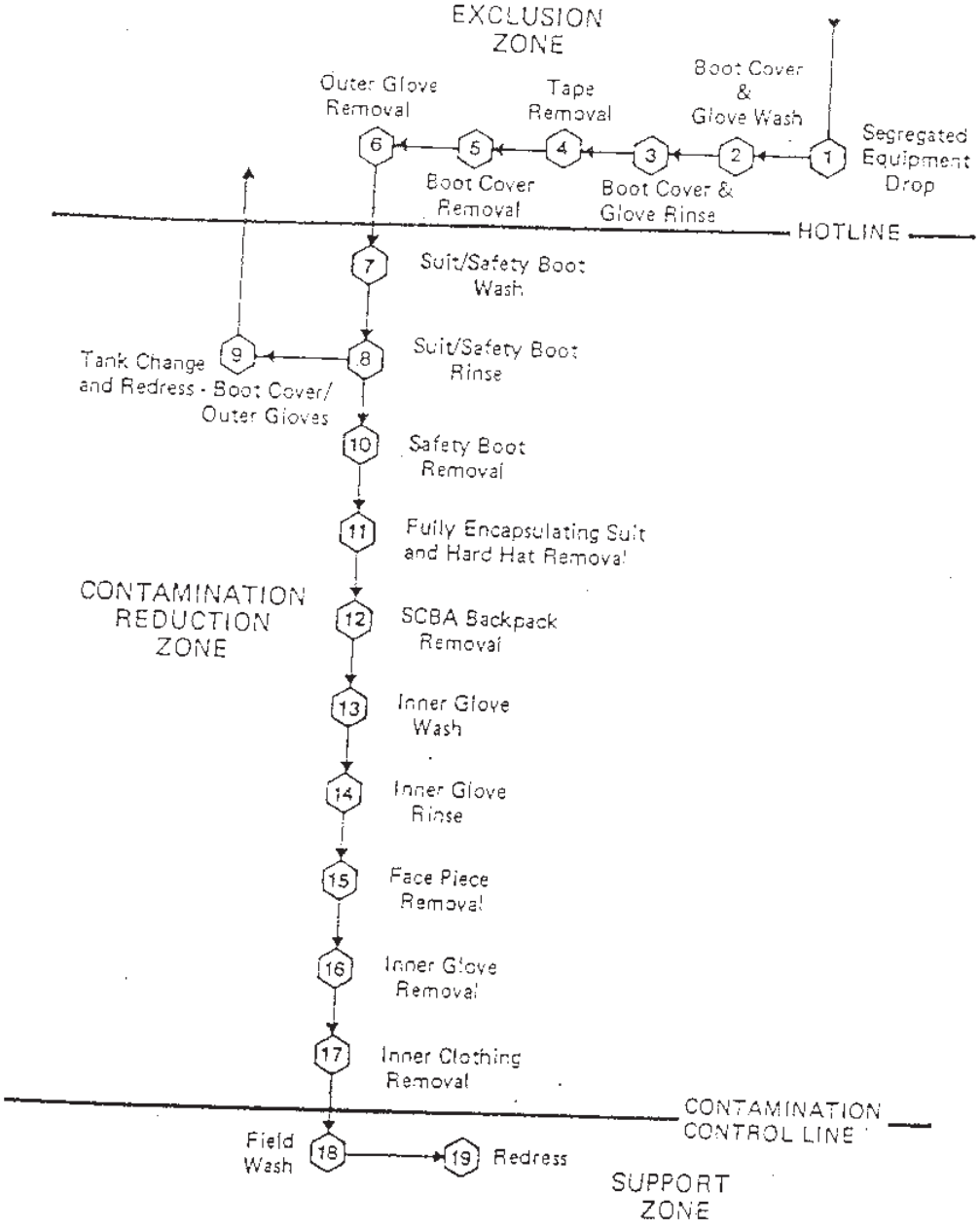
[a] Source: Excerpted from *Field Standard Operating Procedures for the Decontamination of Response Personnel (FSOP 7)*. EPA Office of Emergency and Remedial Response, Hazardous Response Support Division, Washington, DC. January 1985.

P.S.O.P. No. 7

PROCESS DECON PROCEDURES

MAXIMUM DECONTAMINATION LAYOUT

LEVEL A PROTECTION

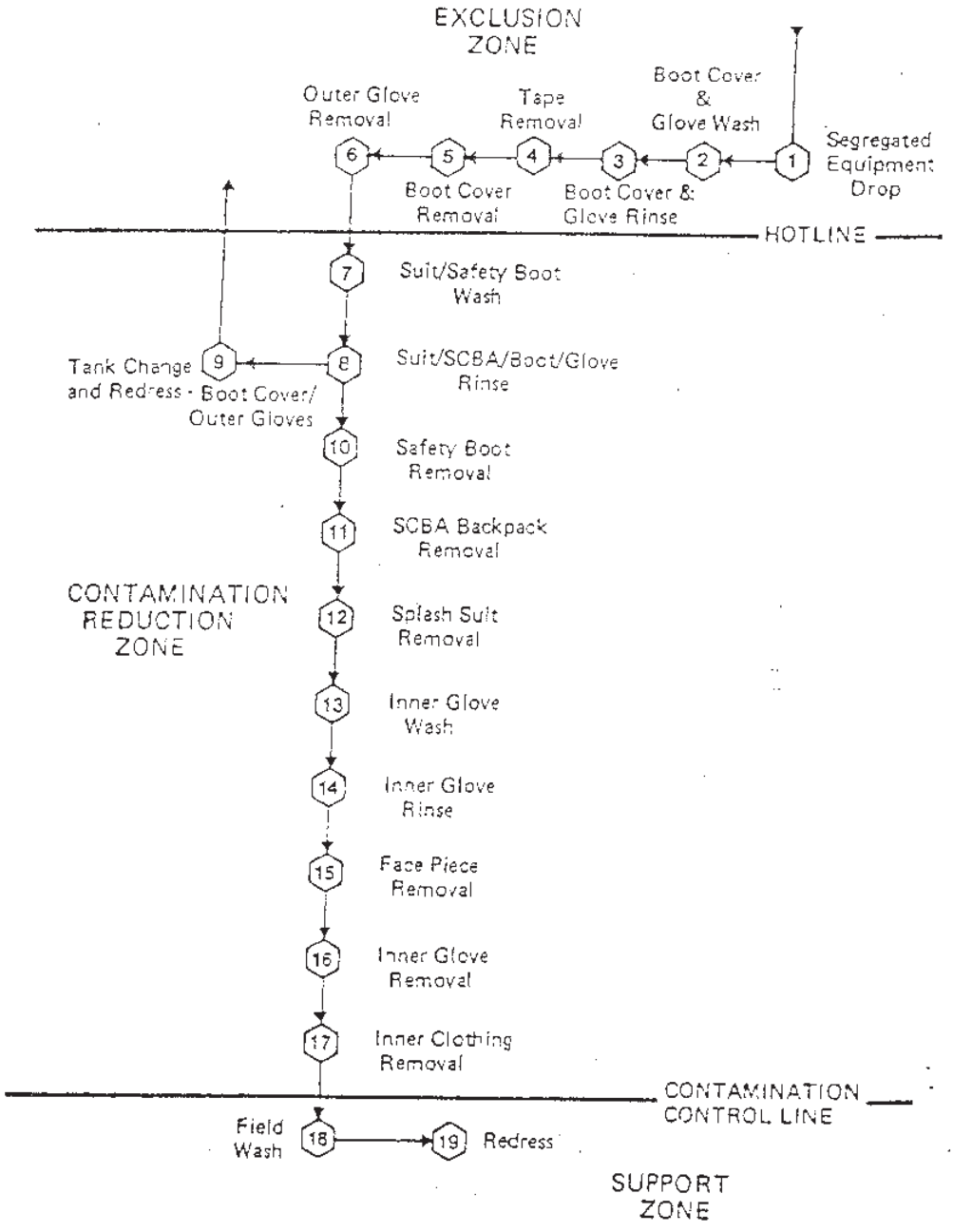


F.S.O.P. No. 7

PROCESS DECON PROCEDURES

MAXIMUM DECONTAMINATION LAYOUT

LEVEL B PROTECTION

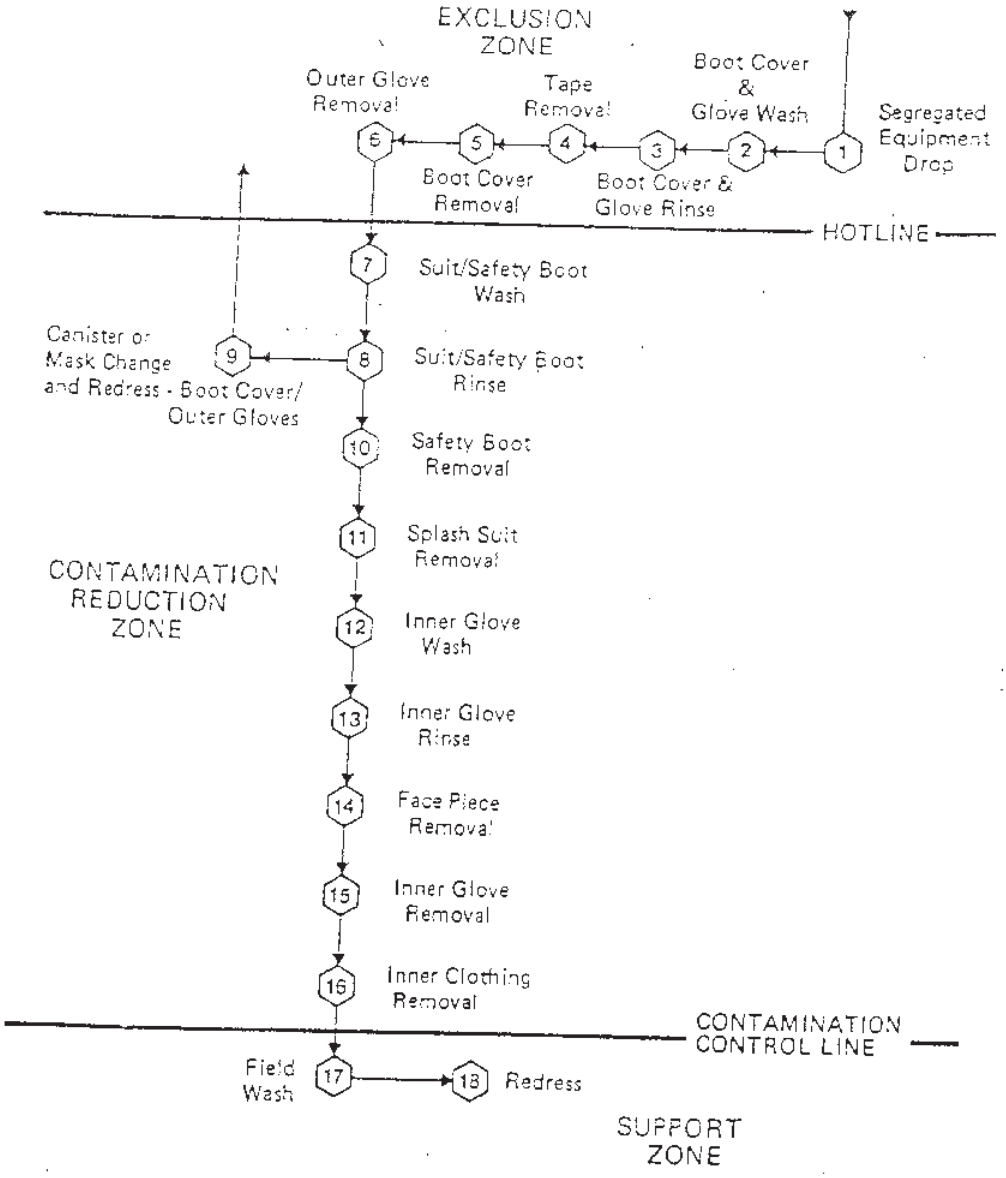


F.S.O.P. No. 7

PROCESS DECON PROCEDURES

MAXIMUM DECONTAMINATION LAYOUT

LEVEL C PROTECTION

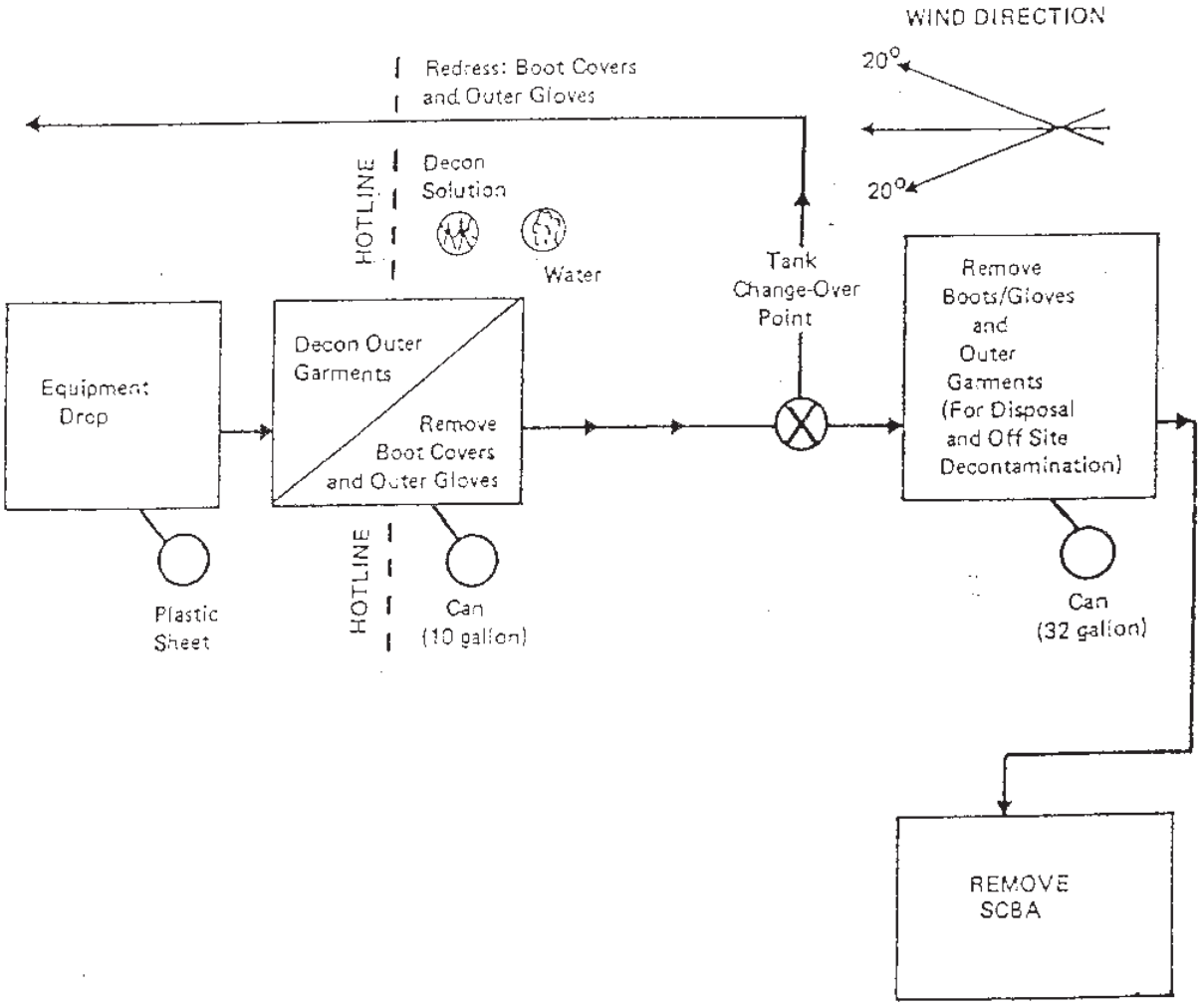


P.S.O.P. No. 7

PROCESS DECON PROCEDURES

MINIMUM DECONTAMINATION LAYOUT

LEVELS A & B PROTECTION

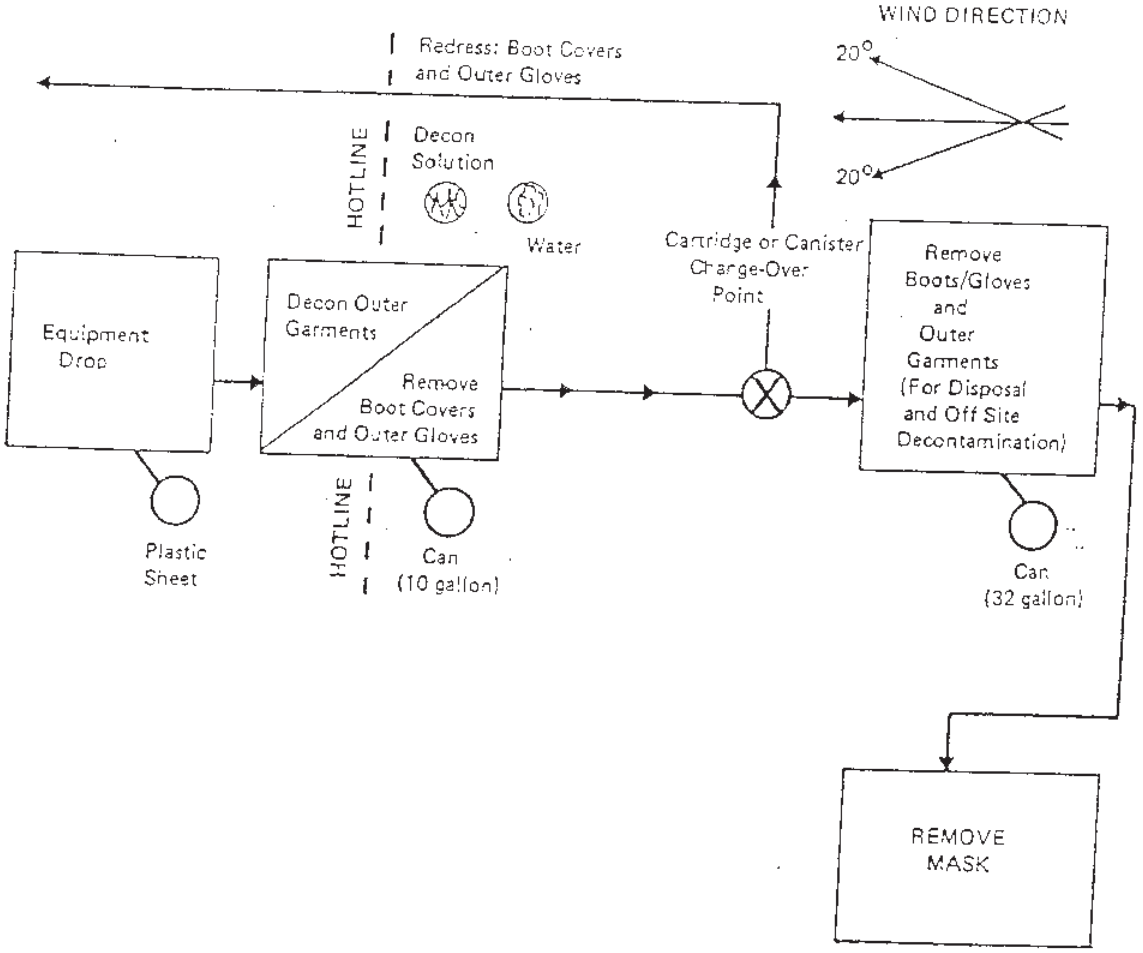


F.S.O.P. No. 7

PROCESS DECON PROCEDURES

MINIMUM DECONTAMINATION LAYOUT

LEVEL C PROTECTION



EQUIPMENT NEEDED TO PERFORM MAXIMUM DECONTAMINATION MEASURES FOR LEVELS A, B, AND C

Station 1:
a. Various Size Containers
b. Plastic Liners
c. Plastic Drop Cloths

Station 2:
a. Containers (20-30 Gallons)
b. Decon Solution or Detergent Water
c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 3:
a. Containers (20-30 Gallons)
OR
High-Pressure Spray Unit
b. Water
c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 4:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 5:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools

Station 6:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 7:
a. Containers (20-30 Gallons)
b. Decon Solution or Detergent Water
c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 8:
a. Containers (20-30 Gallons)
OR
High-Pressure Spray Unit
b. Water
c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 9:
a. Air Tanks or Face Masks and Cartridge Depending on Level
b. Tape
c. Boot Covers
d. Gloves

Station 10:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools
d. Boot Jack

Station 11:
a. Rack
b. Drop Cloths
c. Bench or Stools

Station 12:
a. Table

Station 13:
a. Basin or Bucket
b. Decon Solution
c. Small Table

Station 14:
a. Water
b. Basin or Bucket
c. Small Table

Station 15:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 16:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 17:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 18:
a. Water
b. Soap
c. Small Table
d. Basin or Bucket
e. Field Showers
f. Towels

Station 19:
a. Dressing Trailer is Needed in Inclement Weather
b. Tables
c. Chairs
d. Lockers
e. Cloths

EQUIPMENT NEEDED TO PERFORM MINIMUM DECONTAMINATION MEASURES FOR LEVELS A, B, AND C

Station 1:
a. Various Size Containers
b. Plastic Liners
c. Plastic Drop Cloths

Station 2:
a. Containers (20-30 Gallons)
b. Decon Solution
c. Rinse Water
d. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 3:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools

Station 4:
a. Air Tanks or Masks and Cartridges Depending Upon Level
b. Tape
c. Boot Covers
d. Gloves

Station 5:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools

Station 6:
a. Plastic Sheets
b. Basin or Bucket
c. Soap and Towels
d. Bench or Stools

Station 7:
a. Water
b. Soap

FSOP 7: MAXIMUM MEASURES FOR LEVEL A DECONTAMINATION

Station 1: Segregated Equipment Drop	1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. During hot weather operations, a cool down station may be set up within this area.
Station 2: Boot Cover and Glove Wash	2. Scrub outer boot covers and gloves with decon solution or detergent/water.
Station 3: Boot Cover and Glove Rinse	3. Rinse off decon solution from station 2 using copious amounts of water.
Station 4: Tape Removal	4. Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5: Boot Cover Removal	5. Remove boot covers and deposit in container with plastic liner.
Station 6: Outer Glove Removal	6. Remove outer gloves and deposit in container with plastic liner.
Station 7: Suit and Boot Wash	7. Wash encapsulating suit and boots using scrub brush and decon solution or detergent/water. Repeat as many times as necessary.
Station 8: Suit and Boot	8. Rinse off decon solution using water. Repeat as many times as necessary.
Station 9: Tank Change	9. If an air tank change is desired, this is the last step in the decontamination procedure. Air tank is exchanged, new outer gloves and boot covers donned, and joints taped. Worker returns to duty.
Station 10: Safety Boot Removal	10. Remove safety boots and deposit in container with plastic liner.
Station 11: Fully Encapsulating Suit and Hard Hat Removal	11. Fully encapsulated suit is removed with assistance of a helper and laid out on a drop cloth or hung up. Hard hat is removed. Hot weather rest station maybe set up within this area for personnel returning to site.
Station 12: SCBA Backpack Removal	12. While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve and proceed to next station.
Station 13: Inner Glove Wash	13. Wash with decon solution that will not harm the skin. Repeat as often as necessary.
Station 14: Inner Glove Rinse	14. Rinse with water. Repeat as many times as necessary.
Station 15: Face Piece Removal	15. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 16: Inner Glove Removal	16. Remove inner gloves and deposit in container with liner.

FSOP 7: MAXIMUM MEASURES FOR LEVEL A DECONTAMINATION

Station 17: Inner Clothing Removal	17. Remove clothing and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station 18: Field Wash	18. Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 19: Redress	19. Put on clean clothes.

FSOP 7: MINIMUM MEASURES FOR LEVEL A DECONTAMINATION

Station 1: Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations maybe set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and fully-encapsulating suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Tank Change	4. If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	5. Boots, fully-encapsulating suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6: SCBA Removal	6. SCBA backpack and facepiece is removed (avoid touching face with fingers). SCBA deposited on plastic sheets.
Station 7: Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

FSOP 7: MAXIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 1: Segregated Equipment Drop	1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, cooldown stations may be set up within this area.
Station 2: Boot Cover and Glove Wash	2. Scrub outer boot covers and gloves with decon solution or detergent and water.
Station 3: Boot Cover and Glove Rinse	3. Rinse off decon solution from station 2 using copious amounts of water.
Station 4: Tape Removal	4. Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5: Boot Cover Removal	5. Remove boot covers and deposit in container with plastic liner.
Station 6: Outer Glove removal	6. Remove outer gloves and deposit in container with plastic liner.
Station 7: Suit and Safety Boot Wash	7. Wash chemical-resistant splash suit, SCBA, gloves and safety boots. Scrub with long-handle scrub brush and decon solution. Wrap SCBA regulator (if belt mounted type) with plastic to keep out water. Wash backpack assembly with sponges or cloths.
Station 8: Suit, SCBA, Boot, and Glove Rinse	8. Rinse off decon solution using copious amounts of water.
Station 9: Tank Change	9. If worker leaves exclusion zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, and joints taped. Worker returns to duty.
Station 10: Safety Boot Removal	10. Remove safety boots and deposit in container with plastic liner.
Station 11: SCBA Backpack Removal	11. While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve.
Station 12: Splash Suit Removal	12. With assistance of helper, remove splash suit. Deposit in container with plastic liner.
Station 13: Inner Glove Wash	13. Wash inner gloves with decon solution.
Station 14: Inner Glove Rinse	14. Rinse inner gloves with water.
Station 15: Face Piece Removal	15. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 16: Inner Glove Removal	16. Remove inner gloves and deposit in container with liner.

FSOP 7: MAXIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 17: Inner Clothing Removal	17. Remove inner clothing. Place in container with liner. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station 18: Field Wash	18. Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 19: Redress	19. Put on clean clothes.

FSOP 7: MINIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 1: Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Tank Change	4. If worker leaves exclusive zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6: SCBA Removal	6. SCBA backpack and facepiece is removed. Avoid touching face with finger. SCBA deposited on plastic sheets.
Station 7: Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

FSOP 7: MAXIMUM MEASURES FOR LEVEL C DECONTAMINATION

Station 1: Segrated Equipment Drop	1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Station 2: Boot Cover and Glove Wash	2. Scrub outer boot covers and gloves with decon solution or detergent and water.
Station 3: Boot Cover and Glove Rinse	3. Rinse off decon solution from station 2 using copious amounts of water.
Station 4: Tape Removal	4. Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5: Boot Cover Removal	5. Remove boot covers and deposit in containers with plastic liner.
Station 6: Outer Glove Removal	6. Remove outer gloves and deposit in container with plastic liner.
Station 7: Suit and Boot Wash	7. Wash splash suit, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution.
Station 8: Suit and Boot, and Glove Rinse	8. Rinse off decon solution using water. Repeat as many times as necessary.
Station 9: Canister or Mask Change	9. If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, and joints taped worker returns to duty.
Station 10: Safety Boot Removal	10. Remove safety boots and deposit in container with plastic liner.
Station 11: Splash Suit Removal	11. With assistance of helper, remove splash suit. Deposit in container with plastic liner.
Station 12: Inner Glove Rinse	12. Wash inner gloves with decon solution.
Station 13: Inner Glove Wash	13. Rinse inner gloves with water.
Station 14: Face Piece Removal	14. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 15: Inner Glove Removal	15. Remove inner gloves and deposit in lined container.

FSOP 7: MAXIMUM MEASURES FOR LEVEL C DECONTAMINATION

Station 16: Inner Clothing Removal	16. Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station 17: Field Wash	17. Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 18: Redress	18. Put on clean clothes.

FSOP 7: MINIMUM MEASURES FOR LEVEL C DECONTAMINATION

Station 1: Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Canister or Mask Change	4. If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6: Face Piece Removal	6. Facepiece is removed. Avoid touching face with fingers. Facepiece deposited on plastic sheet.
Station 7: Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

Appendix D – Heat Stress

Heat Stress Prevention Program

1.0 Purpose

This Heat Stress Prevention Program has been developed to provide workers with the training and equipment necessary to protect them from heat related exposures and illnesses.

2.0 Training

All employees who are or may be exposed to potential heat related illnesses will receive training on the following:

- The environmental and personal risk factors that cause heat related illnesses;
- The employer's procedures for identifying, evaluating and controlling exposures to the environmental and personal risk factors for heat illness;
- The importance of frequent consumption of small quantities of water, up to 4 cups per hour under extreme conditions of work and heat;
- The importance of acclimatization;
- The different types of heat illness and the common signs and symptoms of heat illness;
- The importance of immediately reporting to the employer, directly or through the employee's supervisor, symptoms or signs of heat illness in themselves, or in co-workers.
- The employer's procedures for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary;
- Procedures for contacting emergency medical services, and if necessary, for transporting employees to a point where they can be reached by an emergency medical service provider;
- How to provide clear and precise directions to the work site.

3.0 Supervisor Responsibilities

- All supervisors will be provided a copy of this program and training documents prior to assignment of employees working in environments where heat exposures may occur.
- Supervisors will be provided the procedures to follow to implement the applicable provisions of this program.
- Supervisors will be provided the procedures to follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures.

4.0 Provision of Water

Employees shall have access to potable water. Water shall be provided in sufficient quantity at the beginning of the work shift to provide one quart per employee per hour for drinking the entire shift

for a total of 2 gallons per employee per 8-hour shift. Employees may begin the shift with smaller quantities of water if effective procedures for replenishment of water during the shift have been implemented to provide employees one quart or more per hour.

5.0 Access to Shade

Employees suffering from heat illness or believing a preventative recovery period is needed shall be provided access to an area with shade that is either open to the air or provided with ventilation or cooling for a period of no less than five minutes. Such access to shade shall be permitted at all times. Shade areas can include trees, buildings, canopies, lean-tos, or other partial and/or temporary structures that are either ventilated or open to air movement. The interior of cars or trucks are not considered shade unless the vehicles are air conditioned or kept from heating up in the sun in some other way.

6.0 Heat Stress Disorders

6.1 Heat Rash (Prickly Heat)

Symptoms:
- Red blotches and extreme itchiness in areas persistently damp with sweat.
- Prickling sensation on the skin when sweating occurs.

Treatment:
- Cool environment.
- Cool shower.
- Thorough drying.

Heat rashes typically disappear in a few days after exposure. If the skin is not cleaned frequently enough the rash may become infected.

6.2 Heat Cramps

Symptoms:
- Loss of salt through excessive sweating.
- Cramping in back, legs and arms.

Treatment:
- Stretch and massage muscles.
- Replace salt by drinking commercially available carbohydrate/electrolyte replacement fluids.

6.3 Heat Exhaustion

Heat exhaustion occurs when the body can no longer keep blood flowing to supply vital organs and at the same time send blood to the skin to reduce body temperature.

Symptoms:
- Weakness.
- Difficulty continuing work.
- Headache.
- Breathlessness.
- Nausea or vomiting.
- Feeling faint or actually fainting.

Treatment:
- Call 911.

Help the victim to cool off by:
- Resting in a cool place.
- Drinking cool water.
- Removing unnecessary clothing.
- Loosening clothing.
- Showering or sponging with cool water.

It takes 30 minutes to cool the body down once a worker becomes overheated and suffers heat exhaustion.

6.4 Heat Stroke

Heat stroke occurs when the body can no longer cool itself and body temperature rises to critical levels.

Symptoms:
- Confusion.
- Irrational behavior.
- Loss of consciousness.
- Convulsions.
- Lack of sweating.
- Hot, dry skin.
- Abnormally high body temperature.

Treatment:
- Call 911.

Provide immediate, aggressive, general cooling.
- Immerse victim in tub of cool water or;
- Place in cool shower; or
- Spray with cool water from a hose; or
- Wrap victim in cool, wet sheets and fan rapidly.
- Transport victim to hospital.

Do not give anything by mouth to an unconscious victim.

7.0 Safe Work Procedures

7.1 Supervisors Responsibilities

Supervisors are responsible for performing the following:

- Give workers frequent breaks in a cool area away from heat.
- Adjust work practices as necessary when workers complain of heat stress.
- Oversee heat stress training and acclimatization for new workers and for workers who have been off the job for a period of time.
- Monitor the workplace to determine when hot conditions arise.
- Increase air movement by using fans where possible.
- Provide potable water in required quantities.
- Determine whether workers are drinking enough water.
- Make allowances for workers who must wear personal protective clothing (welders, etc.) and equipment that retains heat and restricts the evaporation of sweat.
- Schedule hot jobs for the cooler part of the day; schedule routine maintenance and repair work in hot areas for the cooler times of the day.
- Make available to all workers, cooling devices (hard hat liners/bibs/neck bands) to help rid bodies of excessive heat.

7.2 Workers

Workers are responsible for performing the following:

- Follow instructions and training for controlling heat stress.
- Be alert to symptoms in yourself and others.
- Determine if any prescription medications you're required to take can increase heat stress.
- Wear light, loose-fitting clothing that permits the evaporation of sweat.
- Wear light colored garments that absorb less heat from the sun.
- Drink small amounts of water – approximately 1 cup every 15 minutes.
- Avoid beverages such as tea or coffee.
- Avoid eating hot, heavy meals.
- Do not take salt tablets unless prescribed by a physician.
- Review Attachment 1 for additional information.

8.0 Program Review

The Safety Director will periodically review this program for compliance with all applicable regulatory standards. Updates will be provided to all employees.

Attachment 1

Heat Illness Prevention
Guidance for Workers

Awareness of heat illness symptoms can save your like or the life of a co-worker. The following provides valuable information concerning heat-related illnesses and preventative measures.

- If you are coming back to work from an illness or an extended break or you are just starting a job working in the heat, it is important to be aware that you are more vulnerable to heat stress until your body has time to adjust. Let your employer know you are not used to the heat. It takes about 5-7 days for your body to adjust.

- Drinking plenty of water frequently is vital for workers exposed to the heat. An individual may produce as much as 2 to 3 gallons of sweat per day. In order to replenish that fluid, you should drink 3 to 4 cups of water every hour starting at the beginning of your shift.

- Taking your breaks in a cool shaded area and allowing time for recovery from the heat during the day are effective ways to avoid a heat-related illness.

- Avoid or limit the use of alcohol and caffeine during periods of extreme heat. Both dehydrate the body.

- If you or a co-worker start to feel symptoms such as nausea, dizziness, weakness or unusual fatigue, let your supervisor know and rest in a cool shaded area. If symptoms persist or worsen seek immediate medical attention.

- Whenever possible, wear clothing that provides protection from the sun but allows airflow to the body. Protect your head and shade your eyes if working outdoors.

- When working in the heat pay extra attention to your co-workers and be sure you know how to call for medical attention.

Appendix E – Cold Stress

Cold Stress Prevention

Definitions

Hypothermia: a condition where a person's body loses heat faster than it can be produced. If body temperature drops to 95° F uncontrollable shivers occur. If cooling continues, other symptoms may occur:

- Vague, slow, slurred speech
- Forgetfulness, memory lapses
- Inability to use hands
- Frequent stumbling
- Drowsiness
- Impairment of judgement

Frostbite: A condition where part of the body is frozen. Some of the symptoms include:

- Loss of sensations of touch, pressure and pain (may occur without awareness of any numbness or other sensation)
- Just before freezing, the skin becomes bright red
- At freezing, small patches of white appear on skin
- Skin becomes more elastic

General Requirements

Cold, wet, windy conditions make prime hypothermia weather. Precautions must be taken to keep warm.

In cold environments employees will test for symptoms of hypothermia and frostbite often and wear clothing that is loose and does not restrict the flow of blood to the limbs.

If an employee suspects a co-worker has experienced frostbite, they will seek medical attention immediately.

Workers will wear warm clothing, such as mittens, heavy socks, etc. when the air temperature is below 45° F. Chemical protective clothing, if required on the project, may be used to partially protect the employee from the cold.

When the air temperature is below 30 to 40° F (depending on the employee comfort), clothing for warmth, in addition to chemical protective clothing where necessary must be worn. This would include insulated suits, thermal underwear, wool socks or polypropylene socks to keep the moisture off the feet; insulated gloves, insulated boots, and insulated head cover, such as knit caps.

At air temperatures below 35° F, the following work practices will apply:

- If the outer layer of clothing could become wet then the outer layer of clothing will be an impermeable layer.

- If an employee's underclothing becomes wet then the employee will change into dry clothing immediately.
- When possible, employees will be provided a warm (65° F or above) break area and place to change out of work clothing.
- If appropriate, space heaters will be provided in the work area to warm the hands, feet, etc. Necessary fire and electrical safety practices will be observed when using space heaters. Space heaters will be shut off when the site is not occupied.
- The buddy system will be practiced at all times. An employee observed with severe shivering will leave the cold area immediately.
- Employees will avoid overdressing when going into warm area or when performing activities that are strenuous. This could lead to heat stress.
- Employees handling volatile liquids (gasoline, acetone, alcohol etc.) will take special precautions to avoid soaking clothing or gloves with the liquids to avoid the effect of evaporative cooling.
- Work will be conducted to avoid sitting or standing for long periods of time.

Appendix F – Accident/Incident Report

ACCIDENT/INCIDENT REPORT

DATE OF REPORT:_____

INJURED: _____

EMPLOYER: _____

SITE:_____SITE LOCATION: _____

REPORT PREPARED BY: _____ _____

Signature Title

ACCIDENT/INCIDENT CATEGORY (check all that apply)

___Injury	___Illness	___Near Miss
___ Properly Damage	___Fire	___Chemical Exposure
___Onsite Equipment	___Motor Vehicle	___Electrical
___Mechanical	___Other	

DATE AND TIME OF ACCIDENT/INCIDENT: Narrative Report of Accident/Incident: Identify: 1) actions leading to or contributing to the accident/incident; 2) the accident/incident occurrence; and 3) actions following the accident/incident.

_____

_____

_____

_____

_____

_____

_____

_____

_____

WITNESS TO ACCIDENT/INCIDENT:

1. Name_____ Company:_____

   Address:_____

   Phone No.:_____

2. Name_____ Company:_____

   Address:_____

   Phone No.:_____

INJURED - ILL

Name: _____

Address:_____

SSN: _____ Age:_____

Length of Service: _____Time on Present Job: _____

Title/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

___Disabling ___Non-disabling ___Fatality

___Medical Treatment ___First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB:_____

NATURE OF INJURY OR ILLNESS:_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

CLASSIFICATION OF INJURY:

___Abrasions	___Dislocations	___Punctures
___Bites	___Faint/Dizziness	__ Radiation Bums
___Blisters	___Fractures	___Respiratory Allergy
___Bruises	___Frostbite	___Sprains
___Chemical Bums	___Heat Burns	___Toxic Resp. Exposure
___Cold Exposure	___Heat Exhaustion	___Toxic Ingestion
___Concussion	___Heat Stroke	___Dermal Allergy
___Lacerations		

Part of Body Affected: _____

Degree of Disability:_____

Date Medical Care was Received: _____

Where Medical Care was Received:_____

Address (if off-site):_____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE

Description of Damage: _____

_____

_____

Estimated cost of damage: $_____

ACCIDENT/INCIDENT LOCATION:_____

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident (Object, substance, material, machinery, equipment, conditions): _____

_____

_____

_____

_____

_____

Was weather a factor? : _____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):__

Personal factors (Attitude, knowledge or skill, reaction time, fatigue): _____

ON SITE ACCIDENTS/INCIDENTS

Level of personal protection equipment required in Site Safety Plan:

Modifications:_____

Was injured using required equipment? :_____

If not, how did actual equipment use differ from plan? : _____

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What was or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)_____

ACCIDENT/INCIDENT REPORT REVIEWED BY:

HSO Name Printed HSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature Title

Signature Title

Signature Title

ACCIDENT/INCIDENT FOLLOW-UP Date:

Outcome of accident/incident:

Physician's recommendations:_____

_____

_____

_____

_____

_____

Date injured returned to work:_____

Follow-up performed by:

_____ _____

Signature Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM



Appendix G – OSHA Form

U.S. Department of Labor
Occupational Safety and Health Administration

OSHA
Forms for Recording
Work-Related Injuries and Illnesses

Dear Employer:

This booklet includes the forms needed for maintaining occupational injury and illness records. Many but not all employers must complete the OSHA injury and illness recordkeeping forms on an ongoing basis. Employers in State Plan States should check with their State Plan to see if the exemptions below apply.

Employers with 10 or fewer employees throughout the previous calendar year do not need to complete these forms. Said another way, if there are more than 10 employees at any time during that calendar year, the employer may come under the requirement. When counting employees, you must include full-time, part-time, temporary, and seasonal workers. This exemption is based on the employment of the entire company rather than the establishment. For example, if a company has two establishments, one with 5 employees and one with 7 employees, the company must fill out the forms for each establishment because the company employment is greater than 10.

In addition to the small employer exemption, there is an exemption for establishments classified in certain industries. For example, the forms do not need to be completed for restaurants, banks, and medical offices. A complete list of exempt industries can be found on the OSHA web page at www.osha.gov.

Establishments normally exempt from keeping the OSHA forms must complete the forms if they are informed in writing to do so by the Bureau of Labor Statistics or OSHA. Also, exempt establishments must report to OSHA within 8 hours any work-related fatality or within 24 hours any work-related in-patient hospitalization, amputation, or loss of an eye.

The Occupational Safety and Health Administration shares with you the goal of preventing injuries and illnesses in our nation's workplaces. Accurate injury and illness records will help us achieve that goal.

Occupational Safety and Health Administration
U.S. Department of Labor

What's Inside...

In this package, you'll find everything you need to complete OSHA's *Log* and the *Summary of Work-Related Injuries and Illnesses* for the next several years. On the following pages, you'll find:

- *An Overview: Recording Work-Related Injuries and Illnesses* — General instructions for filling out the forms in this package and definitions of terms you should use when you classify your cases as injuries or illnesses.
- *How to Fill Out the Log* — An example to guide you in filling out the *Log* properly.
- *Log of Work-Related Injuries and Illnesses* — Several pages of the *Log* (but you may make as many copies of the *Log* as you need.) Notice that the *Log* is separate from the *Summary*.



- *Summary of Work-Related Injuries and Illnesses* — Removable *Summary* pages for easy posting at the end of the year. Note that you post the *Summary* only, not the *Log*.



- *Worksheet to Help You Fill Out the Summary* — A worksheet for figuring the average number of employees who worked for your establishment and the total number of hours worked.
- *OSHA's 301: Injury and Illness Incident Report* — A copy of the OSHA 301 to provide details about the incident. You may make as many copies as you need or use an equivalent form.



Take a few minutes to review this package. If you have any questions, visit us online at www.osha.gov or call your local OSHA office. We'll be happy to help you.

U.S. Department of Labor
Occupational Safety and Health Administration

An Overview: Recording Work-Related Injuries and Illnesses

The Occupational Safety and Health (OSH) Act of 1970 requires certain employers to prepare and maintain records of work-related injuries and illnesses. Use these definitions when you classify cases on the Log. OSHA's recordkeeping regulation (see 29 CFR Part 1904) provides more information about the definitions below.

The *Log of Work-Related Injuries and Illnesses* (Form 300) is used to classify work-related injuries and illnesses and to note the extent and severity of each case. When an incident occurs, use the *Log* to record specific details about what happened and how it happened. The *Summary* — a separate form (Form 300A) — shows the totals for the year in each category. At the end of the year, post the *Summary* in a visible location so that your employees are aware of the injuries and illnesses occurring in their workplace.

Employers must keep a *Log* for each establishment or site. If you have more than one establishment, you must keep a separate *Log* and *Summary* for each physical location that is expected to be in operation for one year or longer.

Note that your employees have the right to review your injury and illness records. For more information, see 29 Code of Federal Regulations Part 1904.35, *Employee Involvement.*

Cases listed on the *Log of Work-Related Injuries and Illnesses* are not necessarily eligible for workers' compensation or other insurance benefits. Listing a case on the *Log* does not mean that the employer or worker was at fault or that an OSHA standard was violated.

When is an injury or illness considered work-related?

An injury or illness is considered work-related if an event or exposure in the work environment caused or contributed to the condition or significantly aggravated a preexisting condition. Work-relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the workplace, unless an exception specifically applies. See 29 CFR Part 1904.5(b)(2) for the exceptions. The work environment includes the establishment and other locations where one or more employees are working or are present as a condition of their employment. See 29 CFR Part 1904.5(b)(1).

Which work-related injuries and illnesses should you record?

Record those work-related injuries and illnesses that result in:

- death,
- loss of consciousness,
- days away from work,
- restricted work activity or job transfer, or
- medical treatment beyond first aid.

You must also record work-related injuries and illnesses that are significant (as defined below) or meet any of the additional criteria listed below.

You must record any significant work-related injury or illness that is diagnosed by a physician or other licensed health care professional. You must record any work-related case involving cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum. See 29 CFR 1904.7.

What are the additional criteria?

You must record the following conditions when they are work-related:

- any needlestick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material;
- any case requiring an employee to be medically removed under the requirements of an OSHA health standard;
- tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis;
- an employee's hearing test (audiogram) reveals 1) that the employee has experienced a Standard Threshold Shift (STS) in hearing in one or both ears (averaged at 2000, 3000, and 4000 Hz) and 2) the employee's total hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2000, 3000, and 4000 Hz) in the same ear(s) as the STS.

What is medical treatment?

Medical treatment includes managing and caring for a patient for the purpose of combating disease or disorder. The following are not considered medical treatments and are NOT recordable:

- visits to a doctor or health care professional solely for observation or counseling;

What do you need to do?

1. Within 7 calendar days after you receive information about a case, decide if the case is recordable under the OSHA recordkeeping requirements.
2. Determine whether the incident is a new case or a recurrence of an existing one.
3. Establish whether the case was work-related.
4. If the case is recordable, decide which form you will fill out as the injury and illness incident report.

   You may use *OSHA's 301: Injury and Illness Incident Report* or an equivalent form. Some state workers compensation, insurance, or other reports may be acceptable substitutes, as long as they provide the same information as the OSHA 301.

How to work with the Log

1. Identify the employee involved unless it is a privacy concern case as described below.
2. Identify when and where the case occurred.
3. Describe the case, as specifically as you can.
4. Classify the seriousness of the case by recording the **most serious outcome** associated with the case, with column G (Death) being the most serious and column J (Other recordable cases) being the least serious.
5. Identify whether the case is an injury or illness. If the case is an injury, check the injury category. If the case is an illness, check the appropriate illness category.

- diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes; and
- any procedure that can be labeled first aid. (*See below for more information about first aid.)*

What is first aid?

If the incident required only the following types of treatment, consider it first aid. Do NOT record the case if it involves only:

- using non-prescription medications at non-prescription strength;
- administering tetanus immunizations;
- cleaning, flushing, or soaking wounds on the skin surface;
- using wound coverings, such as bandages, BandAids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages;
- using hot or cold therapy;
- using any totally non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.;
- using temporary immobilization devices while transporting an accident victim (splints, slings, neck collars, or back boards);
- drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters;
- using eye patches;
- using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye;
- using irrigation, tweezers, cotton swab or other simple means to remove splinters or foreign material from areas other than the eye;
- using finger guards;
- using massages;
- drinking fluids to relieve heat stress.

How do you decide if the case involved restricted work?

Restricted work activity occurs when, as the result of a work-related injury or illness, an employer or health care professional keeps, or recommends keeping, an employee from doing the routine functions of his or her job or from working the full workday that the employee would have been scheduled to work before the injury or illness occurred.

How do you count the number of days of restricted work activity or the number of days away from work?

Count the number of calendar days the employee was on restricted work activity or was away from work as a result of the recordable injury or illness. Do not count the day on which the injury or illness occurred in this number. Begin counting days from the day **after** the incident occurs. If a single injury or illness involved both days away from work and days of restricted work activity, enter the total number of days for each. You may stop counting days of restricted work activity or days away from work once the total of either or the combination of both reaches 180 days.

Under what circumstances should you NOT enter the employee's name on the OSHA Form 300?

You must consider the following types of injuries or illnesses to be privacy concern cases:

- an injury or illness to an intimate body part or to the reproductive system,
- an injury or illness resulting from a sexual assault,
- a mental illness,
- a case of HIV infection, hepatitis, or tuberculosis,
- a needlestick injury or cut from a sharp object that is contaminated with blood or other potentially infectious material (see 29 CFR Part 1904.8 for definition), and
- other illnesses, if the employee independently and voluntarily requests that his or her name not be entered on the log.

You must not enter the employee's name on the OSHA 300 *Log* for these cases. Instead, enter "privacy case" in the space normally used for the employee's name. You must keep a separate, confidential list of the case numbers and employee names for the establishment's privacy concern cases so that you can update the cases and provide information to the government if asked to do so.

If you have a reasonable basis to believe that information describing the privacy concern case may be personally identifiable even though the employee's name has been omitted, you may use discretion in describing the injury or illness on both the OSHA 300 and 301 forms. You must enter enough information to identify the cause of the incident and the general severity of the injury or illness, but you do not need to include details of an intimate or private nature.

What if the outcome changes after you record the case?

If the outcome or extent of an injury or illness changes after you have recorded the case, simply draw a line through the original entry or, if you wish, delete or white-out the original entry. Then write the new entry where it belongs. Remember, you need to record the most serious outcome for each case.

Classifying injuries

An injury is any wound or damage to the body resulting from an event in the work environment.

Examples: Cut, puncture, laceration, abrasion, fracture, bruise, contusion, chipped tooth, amputation, insect bite, electrocution, or a thermal, chemical, electrical, or radiation burn. Sprain and strain injuries to muscles, joints, and connective tissues are classified as injuries when they result from a slip, trip, fall or other similar accidents.

U.S. Department of Labor
Occupational Safety and Health Administration

Classifying illnesses

Skin diseases or disorders

Skin diseases or disorders are illnesses involving the worker's skin that are caused by work exposure to chemicals, plants, or other substances.

Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; friction blisters, chrome ulcers; inflammation of the skin.

Respiratory conditions

Respiratory conditions are illnesses associated with breathing hazardous biological agents, chemicals, dust, gases, vapors, or fumes at work.

Examples: Silicosis, asbestosis, pneumonitis, pharyngitis, rhinitis or acute congestion; farmer's lung, beryllium disease, tuberculosis, occupational asthma, reactive airways dysfunction syndrome (RADS), chronic obstructive pulmonary disease (COPD), hypersensitivity pneumonitis, toxic inhalation injury, such as metal fume fever, chronic obstructive bronchitis, and other pneumoconioses.

Poisoning

Poisoning includes disorders evidenced by abnormal concentrations of toxic substances in blood, other tissues, other bodily fluids, or the breath that are caused by the ingestion or absorption of toxic substances into the body.

Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzene, benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays, such as parathion or lead arsenate; poisoning by other chemicals, such as formaldehyde.

Hearing Loss

Noise-induced hearing loss is defined for recordkeeping purposes as a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more in either ear at 2000, 3000 and 4000 hertz, and the employee's total hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2000, 3000, and 4000 hertz) in the same ear(s).

All other illnesses

All other occupational illnesses.

Examples: Heatstroke, sunstroke, heat exhaustion, heat stress and other effects of environmental heat; freezing, frostbite, and other effects of exposure to low temperatures; decompression sickness; effects of ionizing radiation (isotopes, x-rays, radium); effects of nonionizing radiation (welding flash, ultra-violet rays, lasers); anthrax; bloodborne pathogenic diseases, such as AIDS, HIV, hepatitis B or hepatitis C; brucellosis; malignant or benign tumors; histoplasmosis; coccidioidomycosis.

When must you post the Summary?

You must post the *Summary* only — not the *Log* — by February 1 of the year following the year covered by the form and keep it posted until April 30 of that year.

How long must you keep the Log and Summary on file?

You must keep the *Log* and *Summary* for 5 years following the year to which they pertain.

Do you have to send these forms to OSHA at the end of the year?

No. You do not have to send the completed forms to OSHA unless specifically asked to do so.

How can we help you?

If you have a question about how to fill out the *Log*,

- visit us online at www.osha.gov or
- call your local OSHA office.

U.S. Department of Labor
Occupational Safety and Health Administration

Optional

Calculating Injury and Illness Incidence Rates

Note: You can type input into this form and save it. Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

What is an incidence rate?

An incidence rate is the number of recordable injuries and illnesses occurring among a given number of full-time workers (usually 100 full-time workers) over a given period of time (usually one year). To evaluate your firm's injury and illness experience over time or to compare your firm's experience with that of your industry as a whole, you need to compute your incidence rate. Because a specific number of workers and a specific period of time are involved, these rates can help you identify problems in your workplace and/or progress you may have made in preventing work-related injuries and illnesses.

How do you calculate an incidence rate?

You can compute an occupational injury and illness incidence rate for all recordable cases or for cases that involved days away from work for your firm quickly and easily. The formula requires that you follow instructions in paragraph (a) below for the total recordable cases or those in paragraph (b) for cases that involved days away from work, *and* for both rates the instructions in paragraph (c).

(a) *To find out the total number of recordable injuries and illnesses that occurred during the year,* count the number of line entries on your OSHA Form 300, or refer to the OSHA Form 300A and sum the entries for columns (G), (H), (I), and (J).

(b) *To find out the number of injuries and illnesses that involved days away from work,* count the number of line entries on your OSHA Form 300 that received a check mark in column (H), or refer to the entry for column (H) on the OSHA Form 300A.

(c) *The number of hours all employees actually worked during the year.* Refer to OSHA Form 300A and optional worksheet to calculate this number.

You can compute the incidence rate for all recordable cases of injuries and illnesses using the following formula:

Total number of injuries and illnesses X *200,000* ÷ *Number of hours worked by all employees = Total recordable case rate*

(The 200,000 figure in the formula represents the number of hours 100 employees working 40 hours per week, 50 weeks per year would work, and provides the standard base for calculating incidence rates.)

You can compute the incidence rate for recordable cases involving days away from work, days of restricted work activity or job transfer (DART) using the following formula:

(Number of entries in column H + Number of entries in column I) X *200,000* ÷ *Number of hours worked by all employees = DART incidence rate*

You can use the same formula to calculate incidence rates for other variables such as cases involving restricted work activity (column (I) on Form 300A), cases involving skin disorders (column (M-2) on Form 300A), etc. Just substitute the appropriate total for these cases, from Form 300A, into the formula in place of the total number of injuries and illnesses.

What can I compare my incidence rate to?

The Bureau of Labor Statistics (BLS) conducts a survey of occupational injuries and illnesses each year and publishes incidence rate data by various classifications (e.g., by industry, by employer size, etc.). You can obtain these published data at www.bls.gov/iif or by calling a BLS Regional Office.

Worksheet

Total number of injuries and illnesses			Number of hours worked by all employees		Total recordable case rate
_____	X 200,000	÷	_____	=	_____

Number of entries in Column H + Column I			Number of hours worked by all employees		DART incidence rate
_____	X 200,000	÷	_____	=	_____

Save Input Reset

U.S. Department of Labor
Occupational Safety and Health Administration

How to Fill Out the Log

Note: Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

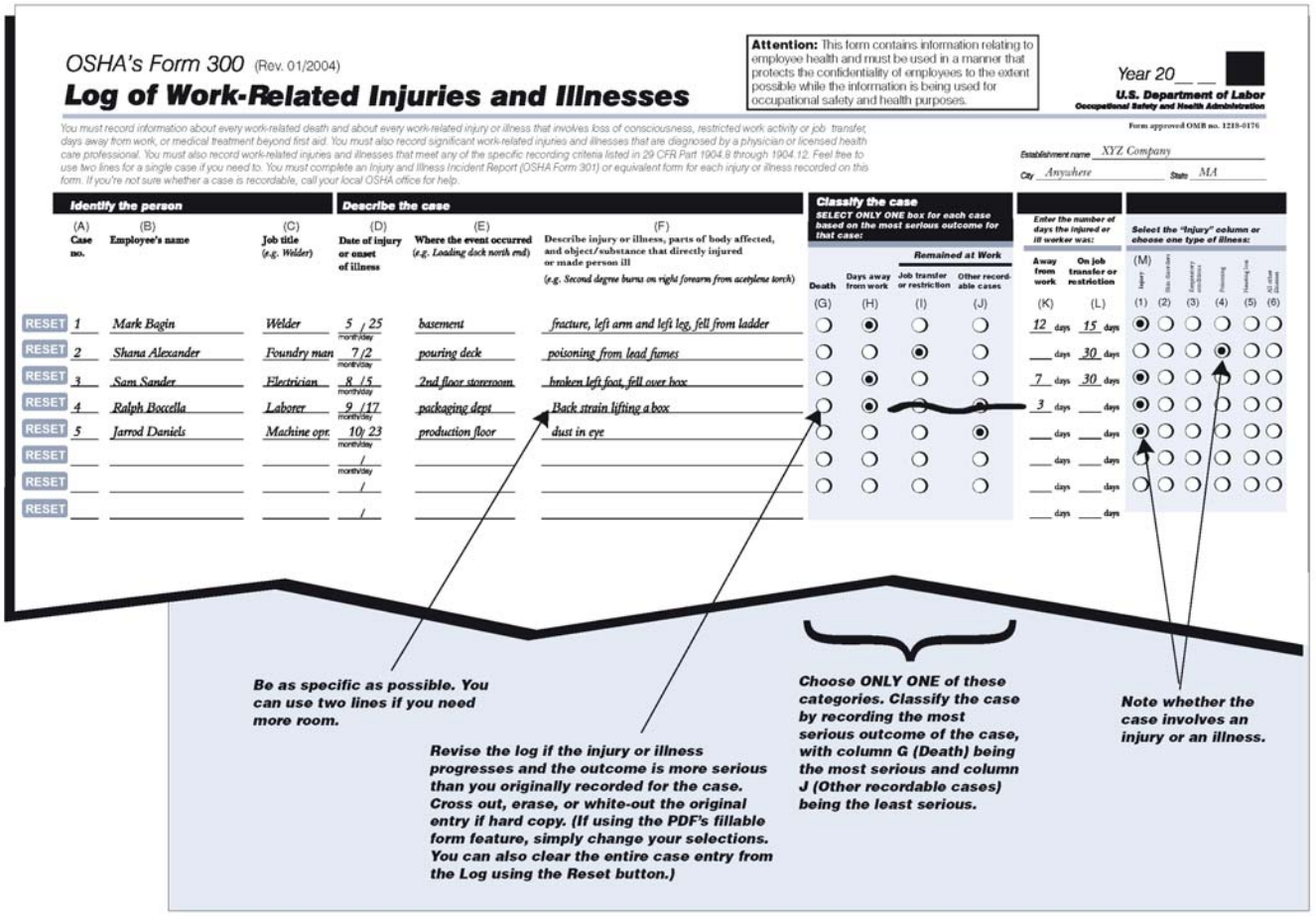
The *Log of Work-Related Injuries and Illnesses* is used to classify work-related injuries and illnesses and to note the extent and severity of each case. When an incident occurs, use the *Log* to record specific details about what happened and how it happened.

If your company has more than one establishment or site, you must keep separate records for each physical location that is expected to remain in operation for one year or longer.

If you need additional copies of the *Log*, you may photocopy the printout or insert additional form pages in the PDF, and then use as many as you need.

The *Summary* — a separate form — shows the work-related injury and illness totals for the year in each category. At the end of the year, count the number of incidents in each category and transfer the totals from the *Log* to the *Summary*. Then post the *Summary* in a visible location so that your employees are aware of injuries and illnesses occurring in their workplace.

You don't post the Log. You post only the Summary at the end of the year.



OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it. Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20 ___

U.S. Department of Labor
Occupational Safety and Health Administration

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Form approved OMB no. 1218-0176

Establishment name _____

City _____ State _____

Identify the person			Describe the case			Classify the case (SELECT ONLY ONE box for each case based on the most serious outcome for that case:)				Enter the number of days the injured or ill worker was:		Select the "Injury" column or choose one type of illness:					
(A) Case no.	(B) Employee's name	(C) Job title (e.g., Welder)	(D) Date of injury or onset of illness (e.g., 2/10)	(E) Where the event occurred (e.g., Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g., Second degree burns on right forearm from acetylene torch)			Remained at Work				(M)					
						Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other record-able cases (J)	Away from work (K)	On job transfer or restriction (L)	Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
					Page totals ▶	___	___	___	___	___	___	___ Injury (1)	___ Skin disorder (2)	___ Respiratory condition (3)	___ Poisoning (4)	___ Hearing loss (5)	___ All other illnesses (6)

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Save Input | Add a Form Page

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it.
Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader.

Year 20 ___

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
_____	_____	_____	_____
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
_____	_____
(K)	(L)

Injury and Illness Types

Total number of . . .	(M)		
(1) Injuries	_____	(4) Poisonings	_____
(2) Skin disorders	_____	(5) Hearing loss	_____
(3) Respiratory conditions	_____	(6) All other illnesses	_____

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name _____

Street _____

City _____ State _____ Zip _____

Industry description (*e.g., Manufacture of motor truck trailers*)

_____

Standard Industrial Classification (SIC), if known (*e.g., 3715*)

_____

OR

North American Industrial Classification (NAICS), if known (e.g., 336212)

_____

Employment information *(If you don't have these figures, see the Worksheet on the next page to estimate.)*

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

_____ _____
Company executive Title

Phone _____ - _____ - _____ Date _____ / _____ / _____

Save Input

U.S. Department of Labor
Occupational Safety and Health Administration

Optional

Worksheet to Help You Fill Out the Summary

Note: You can type input into this form and save it. Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

At the end of the year, OSHA requires you to enter the average number of employees and the total hours worked by your employees on the summary. If you don't have these figures, you can use the information on this page to estimate the numbers you will need to enter on the Summary page at the end of the year.

How to figure the average number of employees who worked for your establishment during the year:

❶ *Add* the total number of employees your establishment paid in all pay periods during the year. Include all employees: full-time, part-time, temporary, seasonal, salaried, and hourly.

The number of employees paid in all pay periods = ❶ _____

❷ *Count* the number of pay periods your establishment had during the year. Be sure to include any pay periods when you had no employees.

The number of pay periods during the year = ❷ _____

❸ *Divide* the number of employees by the number of pay periods.

❶ _____ / ❷ _____ = ❸ _____

❹ *Round the answer* to the next highest whole number. Write the rounded number in the blank marked *Annual average number of employees.*

The number rounded = ❹ _____

For example, Acme Construction figured its average employment this way:

In this pay period . . .	**Acme paid this many employees . . .**
1	10
2	0
3	15
4	30
5	40
▼	▼
24	20
25	15
26	+10
	830

❶ Number of employees paid = 830

❷ Number of pay periods = 26

❸ 830 / 26 = 31.92

❹ 31.92 rounds to 32

32 is the annual average number of employees

How to figure the total hours worked by all employees:

Include hours worked by salaried, hourly, part-time and seasonal workers, as well as hours worked by other workers subject to day to day supervision by your establishment (e.g., temporary help services workers).

Do not include vacation, sick leave, holidays, or any other non-work time, even if employees were paid for it. If your establishment keeps records of only the hours paid or if you have employees who are not paid by the hour, please estimate the hours that the employees actually worked.

If this number isn't available, you can use this optional worksheet to estimate it.

Optional Worksheet

_____ *Find* the number of full-time employees in your establishment for the year.

X _____ *Multiply* by the number of work hours for a full-time employee in a year.

_____ This is the number of full-time hours worked.

+ _____ *Add* the number of any overtime hours as well as the hours worked by other employees (part-time, temporary, seasonal)

_____ *Round* the answer to the next highest whole number. Write the rounded number in the blank marked *Total hours worked by all employees last year*.

Save Input Reset

OSHA's Form 301

Injury and Illness Incident Report

Note: You can type input into this form and save it. Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary,* these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy the printout or insert additional form pages in the PDF, and then use as many as you need.

Completed by _____

Title _____

Phone ___ - ___ - ____ **Date** ___ ___ ____ (Month Day Year)

Information about the employee

1) Full name _____

2) Street _____

3) City _____ **State** _____ **ZIP** _____

4) Date of birth ___ ___ ____ (Month Day Year)

5) Date hired ___ ___ ____ (Month Day Year)

○ **Male**
○ **Female**

Information about the physician or other health care professional

6) Name of physician or other health care professional

_____

7) If treatment was given away from the worksite, where was it given?

Facility _____

Street _____

City _____ **State** _____ **ZIP** _____

8) Was employee treated in an emergency room?
○ **Yes**
○ **No**

9) Was employee hospitalized overnight as an in-patient?
○ **Yes**
○ **No**

Information about the case

10) Case number from the *Log* _____ *(Transfer the case number from the Log after you record the case.)*

11) Date of injury or illness ___ ___ ____ (Month Day Year)

12) Time employee began work _____ ○ **AM** ○ **PM**

13) Time of event _____ ○ **AM** ○ **PM** ○ **Check if time cannot be determined**

14) *What was the employee doing just before the incident occurred?* **Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific. *Examples:* "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."**

15) *What Happened?* **Tell us how the injury occurred. *Examples:* "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."**

16) *What was the injury or illness?* **Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or "sore." *Examples:* "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."**

17) *What object or substance directly harmed the employee? **Examples:*** **"concrete floor"; "chlorine"; "radial arm saw." *If this question does not apply to the incident, leave it blank.***

18) *If the employee died, when did death occur?* **Date of death** ___ ___ ____ (Month Day Year)

Save Input | Add a Form Page | Reset

Public reporting burden for this collection of information is estimated to average 22 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Persons are not required to respond to the collection of information unless it displays a current valid OMB control number. If you have any comments about this estimate or any other aspects of this data collection, including suggestions for reducing this burden, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

U.S. Department of Labor
Occupational Safety and Health Administration

If You Need Help...

If you need help deciding whether a case is recordable, or if you have questions about the information in this package, feel free to contact us. We'll gladly answer any questions you have.

- Visit us online at www.osha.gov
- Call your OSHA Regional office and ask for the recordkeeping coordinator

or

- Call your State Plan office

Federal Jurisdiction

Region 1 - 617 / 565-9860
Connecticut; Massachusetts; Maine; New Hampshire; Rhode Island

Region 2 - 212 / 337-2378
New York; New Jersey

Region 3 - 215 / 861-4900
DC; Delaware; Pennsylvania; West Virginia

Region 4 - 678 / 237-0400
Alabama; Florida; Georgia; Mississippi

Region 5 - 312 / 353-2220
Illinois; Ohio; Wisconsin

Region 6 - 972 / 850-4145
Arkansas; Louisiana; Oklahoma; Texas

Region 7 - 816 / 283-8745
Kansas; Missouri; Nebraska

Region 8 - 720 / 264-6550
Colorado; Montana; North Dakota; South Dakota

Region 9 - 415 / 625-2547

Region 10 - 206 / 553-5930
Idaho

State Plan States

Alaska - 907 / 269-4957

Arizona - 602 / 542-5795

California - 415 / 703-5100

*Connecticut - 860 / 566-4380

Hawaii - 808 / 586-9100

*Illinois - 217 / 782-6206

Indiana - 317 / 232-2688

Iowa - 515 / 281-3661

Kentucky - 502 / 564-3070

Maryland - 410 / 527-4465

Michigan - 517 / 322-1848

Minnesota - 651 / 284-5050

Nevada - 702 / 486-9020

*New Jersey - 609 / 984-1389

New Mexico - 505 / 827-4230

*New York - 518 / 457-2574

North Carolina - 919 / 807-2875

Oregon - 503 / 378-3272

Puerto Rico - 787 / 754-2172

South Carolina - 803 / 734-9669

Tennessee - 615 / 741-2793

Utah - 801 / 530-6901

Vermont - 802 / 828-2765

Virginia - 804 / 786-6613

*Virgin Islands - 340 / 772-1315

Washington - 360 / 902-5554

Wyoming - 307 / 777-7786

*Public Sector only

U.S. Department of Labor

Occupational Safety and Health Administration

Have questions?

If you need help in filling out the *Log* or *Summary,* or if you have questions about whether a case is recordable, contact us. We'll be happy to help you. You can:

- Visit us online at: www.osha.gov
- Call your regional or state plan office. You'll find the phone number listed on the previous page.

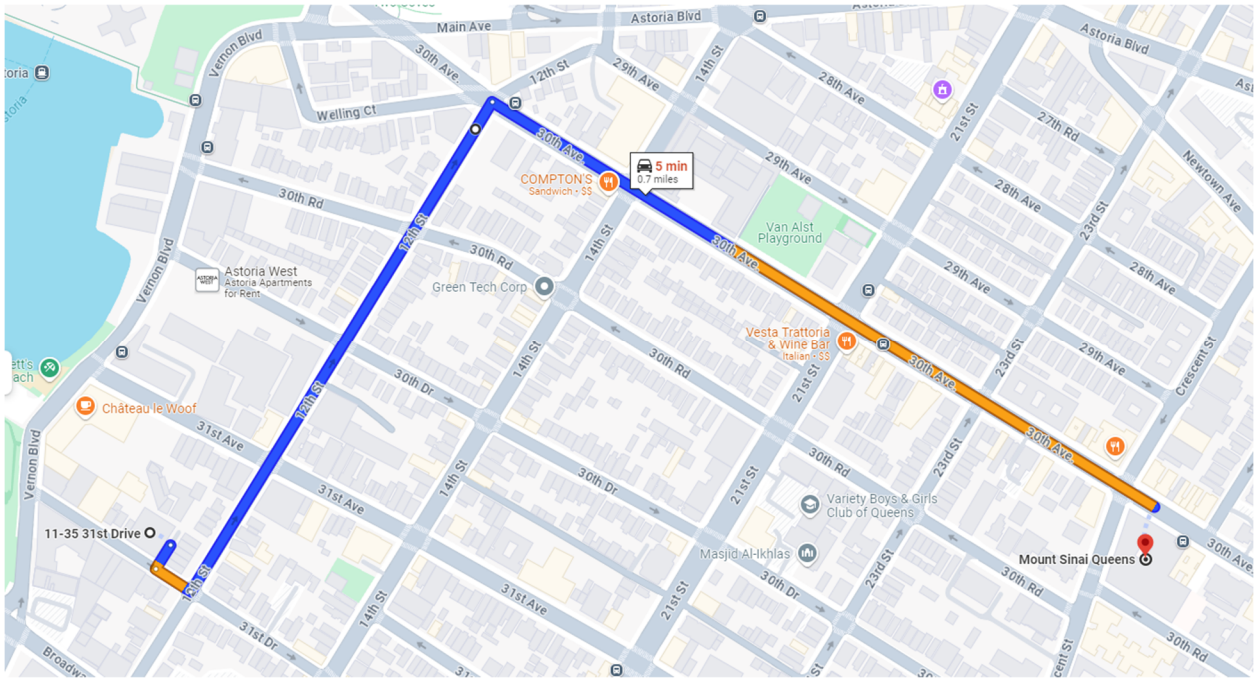
Appendix H – Hospital Maps

DRIVING DIRECTIONS TO THE HOSPITAL

Mount Sinai - Queens

Start out going SOUTHEAST on 31st Dr towards 12th St	112 ft
Turn LEFT at the 1st cross street onto 12th St	0.3 mi
Turn RIGHT onto 30th Ave	0.4 mi
Destination will be on theright	

End at 25-10 30th Ave., Long Island City, NY 11102



APPENDIX E - CAMP

APPENDIX E

COMMUNITY AIR MONITORING PLAN

Former Kenneth Trading Corp. Facility

11-35 31st Drive, Astoria, NY 10026

BCP# C241215

Block 41, Lot 503

Submitted to:

BROWNFIELD CLEANUP PROGRAM

New York State Department of Environmental Conservation

Division of Environmental Remediation

Remedial Bureau B, 12th Floor

625 Broadway

Albany, New York 12233-7016

Prepared for:

Astoria Riverside Park, LLC

280 N. Central Avenue 60A

Hartsdale, New York 10530 Astoria

Prepared by:

YU & Associates Engineers, P.C.

611 River Drive, 3rd Floor

Elmwood Park, NJ 07407

October 30, 2025

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2.0 COMMUNITY AIR MONITORING PROGRAM 1
2.1 COMMUNITY ACTION MONITORING PLAN 1
2.2 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS 2
2.3 PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS 2
2.4 SPECIAL REQUIREMENTS FOR WORK WITHIN 20 FEET OF POTENTIALLY EXPOSED INDIVIDUALS OR STRUCTURES 3
3.0 RECORD KEEPING 3

FIGURE 1 SITE LOCATION MAP
FIGURE 2 SITE PLAN

ATTACHMENT A NYSDOH GENERIC COMMUNITY AIR MONITORING PLAN
ATTACHMENT B DER-10 Appendix 1B: Fugitive Dust and Particulate Monitoring
ATTACHMENT C AIR MONITORING EQUIPMENT SPECIFICATIONS

1.0 INTRODUCTION

YU & Associates, P.C. (YU) prepared this Community Air Monitoring Plan (CAMP) to be implemented at 11-35 31st Drive (hereafter referred to as the "Site"). The intent of the CAMP is to provide a measure of protection for the downwind community. The protection is from potential airborne contaminant releases as a direct result of ground intrusive work activities.

1.1 Site Description

The Site is located at 11-35 31st Drive**,** Astoria, New York (Block 41, Lot 503), see Figure 1 for the Site location. The Site covers an approximately 9,800 square feet parcel of land bounded by multi-story residential apartment building with two-story parking garage to the north, 31st Drive and residential and light industrial buildings to the south, an asphalt paved parking lot and multi-family residential apartment buildings to the east, and an outdoor recreation area to the west (see Figure 2 for reference). The Site is currently vacant.

2.0 COMMUNITY AIR MONITORING PROGRAM

Depending upon the nature of contamination, chemical-specific monitoring with appropriately sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH. The site's CAMP was written in compliance with the NYSDOH generic CAMP (Attachment A) and the NYSDEC DER-10 Appendix 1B: Fugitive Dust and Particulate Monitoring (Attachment B).

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

2.1 Community Action Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. This site will involve VOC and particulate monitoring.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

2.2 VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below. The equipment specification is included in Attachment C.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

2.3 Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. The equipment specification is included in Attachment C. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume, provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

2.4 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.

1. If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.
2. If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.
3. Depending upon 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.

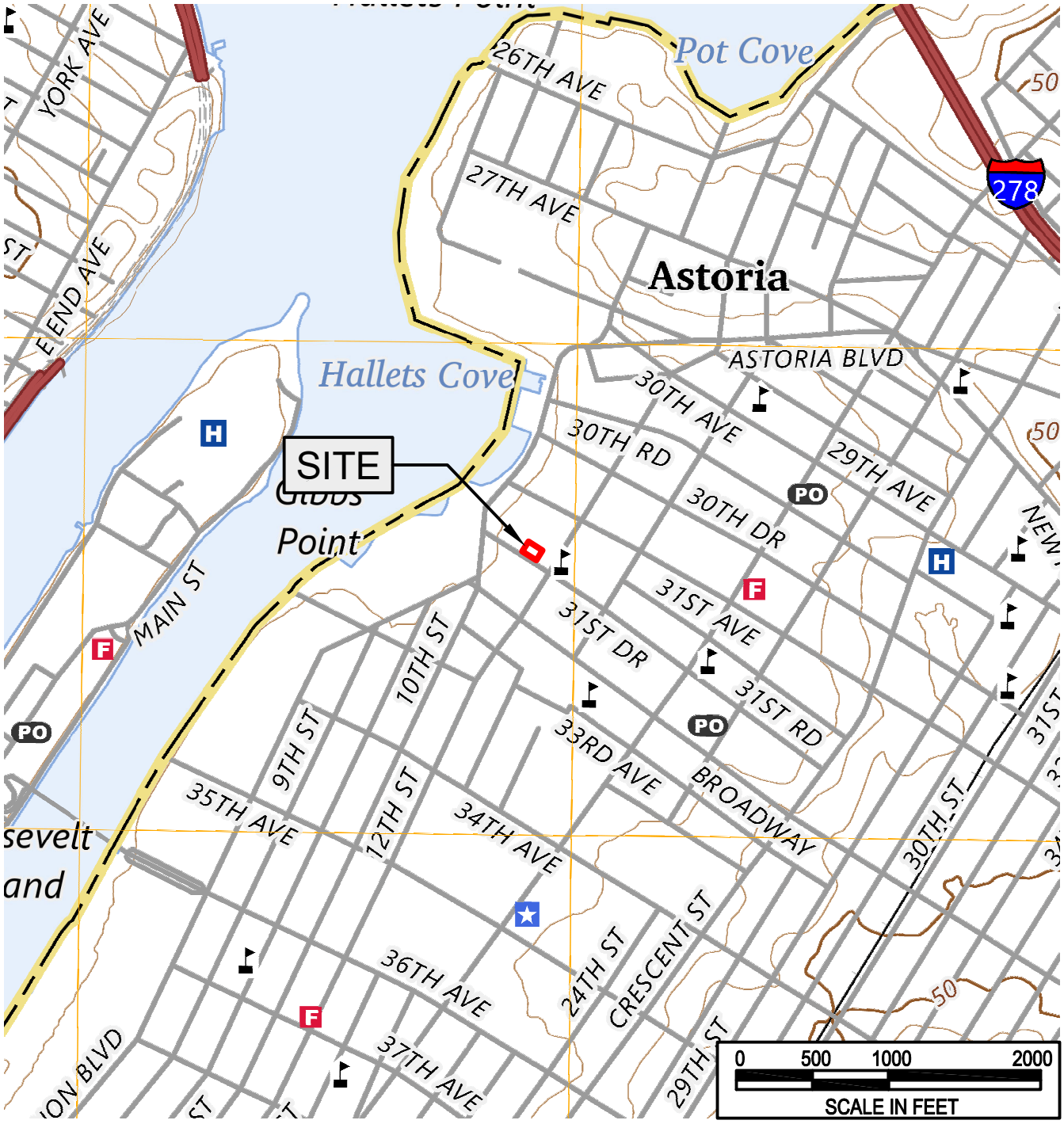
2.5 Special Requirements for Indoor Work With Co-Located Residences or Facilities

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" except that in this instance "nearby/occupied structures" would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum

3.0 RECORD KEEPING

Air monitoring data will be recorded every 15 minutes in a bound field notebook. At the completion of each workday, the data recorded by each monitoring station will be downloaded and reviewed by YU. The daily CAMP data will be submitted to NYSDEC and NYSDOH within each daily field report, and all CAMP data from this supplemental remedial investigation will be included in the supplemental Remedial Investigation Report.

FIGURES



Map Reference: USGS Central Park Quadrangle 7.5-Minute Series NY - NJ 2023

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering

611 River Drive - 3rd Floor
Elmwood Park, NJ 07407

Tel: (201) 791-0075
Fax: (201) 791-4533

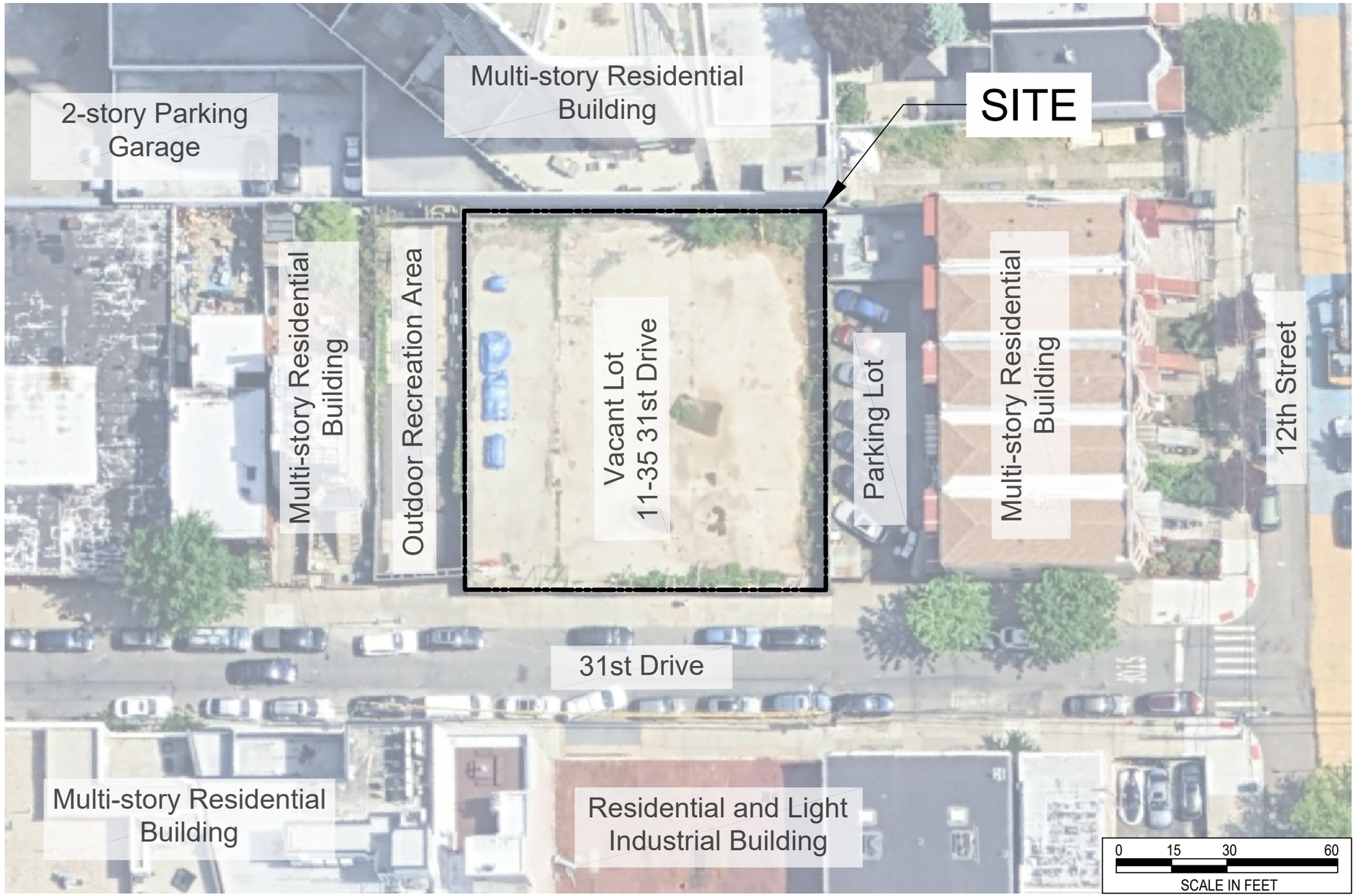
SITE LOCATION MAP
11-35 31st Drive

ASTORIA

QUEEN NEW YORK

JOB NO.: 23094	SCALE: As Shown	DATE: 7/17/2025	FIG. 1

P:\23123094 (11-35 31st Drive)\Supplemental Investigation\Work Plan\DWG\ 11-35 31st Drive Figures.dwg Jul 17, 2025 - 11:03am zyang



LEGEND:

Site Boundary

Base Map Reference: Google Earth Pro, 2023

YU & Associates
Geotechnical, Environmental and Civil Engineering

611 River Drive - 3rd Floor
Elmwood Park, NJ 07407

Tel: (201) 791-0075
Fax: (201) 791-4533

SITE PLAN

11-35 31st Street

Astoria

QUEENS NEW YORK

JOB NO.: 23094	SCALE: As Shown	DATE: 08/05/2025	FIG. 2

ATTACHMENT A - NYSDOH GENERIC COMMUNITY AIR MONITORING PLAN

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

ATTACHMENT B - FUGITIVE DUST AND PARTICULATE MONITORING

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

ATTACHMENT C - AIR MONITORING EQUIPMENT SPECIFICATIONS

DUSTTRAK™ II AEROSOL MONITORS MODELS 8530, 8530EP AND 8532

DESKTOP OR HANDHELD UNITS FOR ANY ENVIRONMENT, ANY APPLICATION



DustTrak™ II Aerosol Monitors are battery-operated, data-logging, light-scattering laser photometers that give you real-time aerosol mass readings. They use a sheath air system that isolates the aerosol in the optics chamber to keep the optics clean for improved reliability and low maintenance. From desktop and desktop with external pump models to a handheld model, the DustTrak II offers a suitable solution for harsh industrial workplaces, construction and environmental sites and other outdoor applications, as well as clean office settings. The DustTrak II monitors measure aerosol contaminants such as dust, smoke, fumes and mists.

Features and Benefits

All Models

+ Real-time mass concentration readings and data-logging allow for data analysis during and after sampling
+ Measure aerosol concentrations corresponding to PM1, PM2.5, Respirable, and PM10 size fractions, using a variety of inlet conditioners
+ Easy-to-use graphical user interface with color touch-screen for effortless operation

Handheld Model (8532)

+ Long life internal pump for continuous sampling
+ Single-point data collection for walk through surveys
+ Lightweight design with ergonomic handle for portable applications

Desktop Models (8530 and 8530EP)

+ Energy-efficient, long lasting external pump for continuous, unattended, 24/7, outdoor monitoring applications (Model 8530EP only)
+ Long life internal pump for shorter work-shift or IAQ sampling applications (Model 8530)
+ Gravimetric reference sampling capability for custom reference calibrations
+ Automatic zeroing (with optional zero module) to minimize the effect of zero drift
+ STEL alarm setpoint for tracking 15-minute average mass concentrations
+ Environmental protected and tamper-proof secure (with an optional environmental enclosure)
+ Inlet sample conditioning (with optional heated inlet sample conditioner) to reduce the effect of humidity on photometric mass measurements (for use with an environmental enclosure)
+ Cloud Data Management System as hosted by Netronix™

TSI®

UNDERSTANDING, ACCELERATED

Desktop Models: Ideal for Long-Term Surveys and Remote Monitoring Applications

The DustTrak II is offered as a standard desktop (Model 8530), as well as a desktop with external pump (Model 8530EP.) Both models have manual and programmable data logging functions, making them ideal for unattended applications. The standard desktop model is most suitable for indoor, continuous monitoring, while the desktop with external pump is designed for 24/7 unattended, remote monitoring outdoors.

The DustTrak II desktop models come with USB (device and host), Ethernet, and analog and alarm outputs allowing remote access to data. User adjustable alarm setpoints for instantaneous or 15-minute short-term excursion limit (STEL) are also available on desktop models. The alarm output with user-defined setpoint alerts you when upset or changing conditions occur.

The DustTrak II desktop monitors have several unique features:

+ Measure aerosols in high concentrations up to 400 mg/m3.
+ External pump (Model 8530EP) with low power consumption for continuous, unattended monitoring in remote outdoor locations.
+ Gravimetric sampling capability using a 37-mm filter cassette which can be inserted in-line with the aerosol stream allowing you to perform an integral gravimetric analysis for custom reference calibrations.
+ Zeros automatically using the external zeroing module. This optional accessory is used when sampling over extended periods of time. By zeroing the monitor during sampling, the effect of zero drift is minimized.
+ STEL alarm feature for tracking 15-minute average mass concentrations when alarm setpoint has been reached for applications like monitoring fugitive emissions at hazardous waste sites.
+ Provide for environmental protection and tamper-proof security using an environmental enclosure. This optional accessory encloses the instrument within a waterproof, lockable, custom-designed case.
+ Condition the sample air stream before entering the instrument optics using a heated inlet sample conditioner (designed for use with an environmental enclosure.) This optional accessory is used in humid environments. By conditioning the sample, the humidity and water vapor are minimized, reducing elevated measurements.

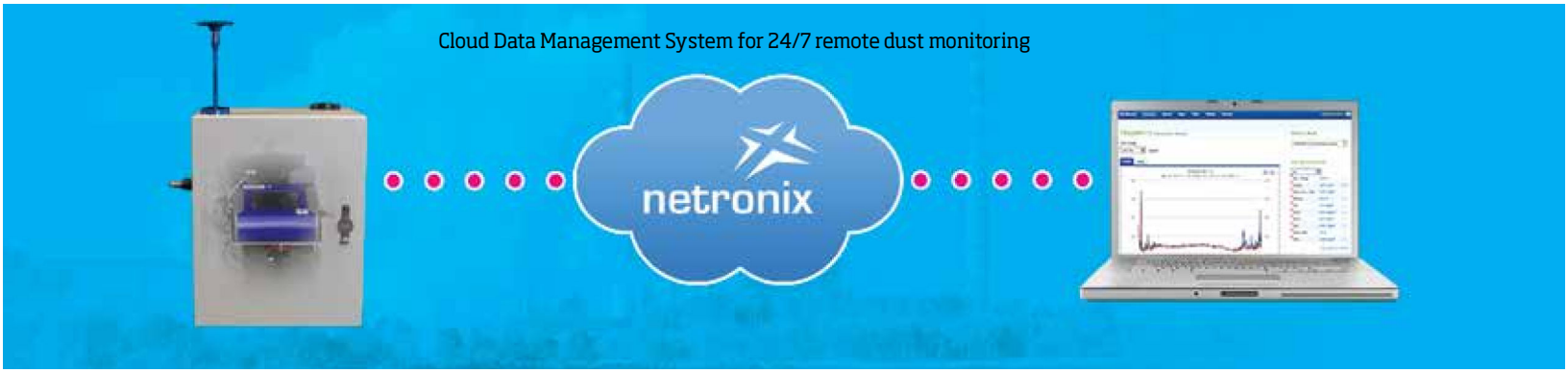
Handheld Models: Perfect for Walk-Through Surveys and Single-Point Data Collection Applications

The DustTrak II Handheld Model 8532 is lightweight and portable. It is perfect for industrial hygiene surveys, point source location monitoring, indoor air quality investigations, engineering control evaluations/validation, and for baseline trending and screening. Like the desktop models, it has manual and programmable data logging functions. In addition, the handheld model also has a single-point data logging capability. Single-point data collection is used for walk-through industrial hygiene surveys and indoor air quality investigations.

Applications	Desktop	Handheld
Aerosol research studies	+	+
Baseline trending and screening	+	+
Engineering control evaluations		+
Engineering studies		+
Epidemiology studies	+	+
Indoor air quality investigations	+	+
Industrial/occupational hygiene surveys	+	+
Point source monitoring		+
Outdoor environmental monitoring	+	
Process monitoring	+	+
Remote monitoring	+	
Battery Performance		
Models 8530 and 8530EP (Typical) 6600 mAH Li-Ion Battery Pack (P/N 801680)	1 Battery	2 Batteries
Battery runtime (hours)	Up to 6	Up to 12
Charge time* (hours) in DustTrak	4	8
Charge time* (hours) in external battery charger (P/N 801685)	4	8

Model 8532 (Typical) 3600 mAH Li-Ion Battery Pack (P/N 801681)	Battery
Battery runtime (hours)	Up to 6
Charge time* (hours) in DustTrak	4
Charge time* (hours) in external battery charger (P/N 801686)	4

* Of a fully depleted battery



DustTrak II Aerosol Monitor Features

All Models

+ Li-Ion rechargeable batteries
+ Internal and external battery charging capabilities
+ Outlet port for isokinetic sampling applications
+ User serviceable sheath flow and pump filters
+ Logged test pause and restart feature
+ Logged test programming
  + Color touch screen–either manual mode or program mode
  + TrakPro™ Data Analysis Software via a PC
+ User adjustable custom calibration settings
+ Instantaneous alarm settings with visual and audible warnings
+ Real-time graph display
+ View statistical information during and after sampling
+ On-screen instrument status indicators: FLOW, LASER and FILTER
+ Filter service indicator for user preventative maintenance

Desktop Models (8530 and 8530EP)

+ Long life external pump (8530EP)
+ Internal pump (8530)
+ Hot swappable batteries
+ Gravimetric reference sample capability
+ STEL alarm setpoint

Optional Accessories

+ Auto zeroing module
+ Protective environmental enclosure (8535 and 8537)
+ Heated inlet sample conditioner (for use with an environmental enclosure)
+ Cloud Data Management System as hosted by Netronix™

Handheld Model (8532)

+ Long life internal pump
+ Single-point data collection for walk through surveys

Easy to Program and Operate

The graphical user interface with color touch-screen puts everything at your fingertips. The easy-to-read display shows real-time mass concentration and graphical data, as well as other statistical information along with instrument pump, laser and flow status, and much more. Perform quick walk-through surveys or program the instrument's advanced logging modes for long-term sampling investigations. Program start times, total sampling times, logging intervals, alarm setpoints and many other parameters. You can even set up the instrument for continuous unattended operation.

TrakPro™ Software Makes Monitoring Easier than Ever

TrakPro™ Data Analysis Software allows you to set up and program directly from a PC. It even features the ability for remote programming and data acquisition from your PC via wireless communication options or over an Ethernet network. As always, you can print graphs, raw data tables, and statistical and comprehensive reports for record keeping purposes.



Desktop Monitor with
External Pump, Model 8530EP



SPECIFICATIONS

DUSTTRAK™ II AEROSOL MONITORS MODELS 8530, 8530EP AND 8532

Sensor Type
90° light scattering

Particle Size Range
0.1 to 10 µm

Aerosol Concentration Range

8530 Desktop	0.001 to 400 mg/m³
8530EP Desktop with External Pump	0.001 to 400 mg/m³
8532 Handheld	0.001 to 150 mg/m³

Resolution
±0.1% of reading or 0.001 mg/m³, whichever is greater

Zero Stability
±0.002 mg/m³ per 24 hours at 10 sec time constant

Flow Rate
3.0 L/min set at factory, 1.40 to 3.0 L/min, user adjustable

Flow Accuracy
±5% of factory set point, internal flow controlled

Temperature Coefficient
+0.001 mg/m³ per °C

Operational Temp
32 to 120°F (0 to 50°C)

Storage Temp
-4 to 140°F (-20 to 60°C)

Operational Humidity
0 to 95% RH, non-condensing

Time Constant
User adjustable, 1 to 60 seconds

Data Logging
5 MB of on-board memory (>60,000 data points)
45 days at 1 minute logging interval

Log Interval
User adjustable, 1 second to 1 hour

Physical Size (H x W x D)

Handheld	4.9 x 4.8 x 12.5 in. (12.5 x 12.1 x 31.6 cm)
Desktop	5.3 x 8.5 x 8.8 in. (13.5 x 21.6 x 22.4 cm)
External Pump	4.0 x 7.0 x 3.5 in. (10.0 x 18.0 x 9.0 cm)

Weight

Handheld	2.9 lb (1.3 kg), 3.3 lb (1.5 kg) with battery
Desktop	3.5 lb (1.6 kg), 4.5 lb (2.0 kg)-1 battery, 5.5 lb (2.5 kg)-2 batteries
External Pump	3.0 lb (1.4 kg)

Communications

8530	USB (host and device) and Ethernet. Stored data accessible using flash memory drive
8530EP	USB (host and device) and Ethernet. Stored data accessible using flash memory drive plus, cable assembly for external pump
8532	USB (Hose and device). Stored data accessible using flash memory drive

Power-AC
Switching AC power adapter with universal line cord included, 115-240 VAC

Analog Out

8530/8530EP	User selectable output, 0 to 5 V or 4 to 20 mA. User selectable scaling range

Alarm Out

8530/8530EP	Relay or audible buzzer Relay Non-latching MOSFET switch + User selectable set point + -5% deadband + Connector 4-pin, Mini-DIN connectors
8532	Audible buzzer

Screen

8530	5.7 in. VGA color touchscreen
8532	3.5 in. VGA color touchscreen

Gravimetric Sampling

8530/8530EP	Removable 37 mm cartridge (user supplied)

CE Rating

Immunity	EN61236-1:2006
Emissions	EN61236-1:2006

Specifications are subject to change without notice.

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TSI Incorporated - Visit our website **www.tsi.com** for more information.

USA	**Tel:** +1 800 874 2811	**India**	**Tel:** +91 80 67877200
UK	**Tel:** +44 149 4 459200	**China**	**Tel:** +86 10 8219 7688
France	**Tel:** +33 4 91 11 87 64	**Singapore**	**Tel:** +65 6595 6388
Germany	**Tel:** +49 241 523030		

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MINIRAE® 3000 +

Portable Handheld VOC Monitor



The MiniRAE 3000 + is a comprehensive handheld VOC (Volatile Organic Compound) monitor that uses a third-generation patented PID technology to accurately measure one of the highest levels of ionizable chemicals available on the market.

It provides full-range measurement from 0 to 15,000 ppm of VOCs. The MiniRAE 3000 + has a built-in wireless modem that allows realtime data connectivity with the command center located up to 2 miles (3 km) away through a Bluetooth connection to a RAELink 3* portable modem or optionally via Mesh Network.



Workers can quickly measure VOCs and wirelessly transmit data

- Highly accurate VOC measurements
- Reflex PID Technology™
- Low maintenance — easy access to lamp and sensor
- Low cost of ownership
- 3-year 10.6eV lamp warranty
- BLE module & dedicated APP for Enhanced Datalogging capability

APPLICATIONS

- Oil and Gas
- HazMat
- Industrial Safety
- Civil Defense
- Environmental and Indoor Air Quality

FEATURES AND BENEFITS

- Third-generation patented PID technology
- Reflex PID Technology™
- VOC detection range from 0 to 15,000 ppm
- 3-second response time
- Humidity compensation with built-in humidity and temperature sensors
- Six-month datalogging
- Highly connectivity capability through multiple wireless module options
- Large graphic display with integrated flashlight
- Multi-language support with 10 languages encoded
- IP- 67 waterproof design

Honeywell

Minirae® 3000 + Technical Specifications

INSTRUMENT SPECIFICATIONS	
Size	10" L x 3.0" W x 2.5" H (25.5 cm x 7.6 cm x 6.4 cm)
Weight	26 oz (738 g)
Sensors	Photoionization sensor with standard 10.6 eV or optional 9.8 eV or 11.7 eV lamp
Battery	• Rechargeable, external field-replaceable Lithium-Ion battery pack • Alkaline battery adapter
Running time	16 hours of operation (12 hours with alkaline battery adapter)
Display Graphic	4 lines, 28 x 43 mm, with LED backlight for enhanced display readability
Keypad	1 operation and 2 programming keys, 1 flashlight on/off
Direct Readout	Instantaneous reading • VOCs as ppm by volume (mg/m³) • High values • STEL and TWA • Battery and shutdown voltage • Date, time, temperature
Alarms	95dB at 12" (30 cm) buzzer and flashing red LED to indicate exceeded preset limits • High: 3 beeps and flashes per second • Low: 2 beeps and flashes per second • STEL and TWA: 1 beep and flash per second • Alarms latching with manual override or automatic reset • Additional diagnostic alarm and display message for low battery and pump stall
EMC/RFI	Compliant with EMC directive (2004/108/EC) EMI and ESD test: 100MHz to 1GHz 30V/m, no alarm Contact: ±4kV Air: ±8kV, no alarm
IP Rating	• IP-67 unit off and without flexible probe • IP-65 unit running
Datalogging	Standard 6 months at one-minute intervals
Calibration	Two-point or three-point calibration for zero and span. Reflex PID Technology™ Calibration memory for 8 calibration gases, alarm limits, span values and calibrationdates
Sampling Pump	• Internal, integrated flow rate at 500 cc/mn • Sample from 100' (30m) horizontally or vertically
Low Flow Alarm	Auto pump shutoff at low-flow condition
Communication & Data Download	• Download data and upload instrument set-up from PC through charging cradle or using BLE module and dedicated APP • Wireless data transmission through built-in RF modem
Wireless Network	Mesh RAE Systems Dedicated Wireless Network
Wireless Range (Typical)	Up to 15ft (5m) for BLE EchoView Host: LOS > 660 ft (200 m) ProRAE Guardian & RAEMesh Reader: LOS > 660 ft (200 m) ProRAE Guardian & RAELink3 Mesh: LOS > 330 ft (100 m)
Safety Certifications	**US and Canada:** CSA, Classified as Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, D **Europe:** ATEX II 2G EEx ia IIC T4
Temperature	-4° to 122° F (-20° to 50° C)
Humidity	0% to 95% relative humidity (non-condensing)
Attachments	Durable bright yellow rubber boot
Warranty	3 years for 10.6 eV lamp, 1 year for pump, battery, sensor and instrument
Wireless Frequency	ISM license-free band. IEEE 802.15.4 Sub 1GHz
Wireless Approvals	FCC Part 15, CE R&TTE, Others[1]
Radio Module	Supports BLE or Bluetooth or RM900

[1] Contact RAE Systems for country-specific wireless approvals and certificates.
Specifications are subject to change.

SENSOR SPECIFICATIONS			
Gas Monitor	Range	Resolution	Response Time T90
VOCs	0 to 999.9 ppm 1,000 to 15,000 ppm	0.1 ppm 1 ppm	< 3 s < 3 s

MONITOR ONLY INCLUDES:

- MiniRAE 3000 + Monitor, Model PGM-7320
- Wireless communication module built in, as specified
- Datalogging with ProRAE Studio II Package
- Charging/download adapter
- RAE UV lamp, as specified
- Flex-I-Probe™
- External filter
- Rubber boot
- Alkaline battery adapter
- Lamp-cleaning kit
- Tool kit
- Soft leather case

OPTIONAL CALIBRATION KIT ADDS:

- 100 ppm isobutylene calibration gas, 34L
- Calibration regulator and flow controller

OPTIONAL GUARANTEED COST-OF-OWNERSHIP PROGRAM:

- 4-year repair and replacement warranty
- Annual maintenance service

For more information
www.honeywellanalytics.com
www.raesystems.com

Europe, Middle East, Africa
Life Safety Distribution GmbH
Tel: 00800 333 222 44 (Freephone number)
Tel: +41 44 943 4380 (Alternative number)
Middle East Tel: +971 4 450
5800 (Fixed Gas Detection)
gasdetection@honeywell.com

Americas
Honeywell Analytics Distribution Inc.
Tel: +1 847 955 8200
Toll free: +1 800 538 0363
detectgas@honeywell.com
Honeywell RAE Systems
Phone: +1 408 952 8200
Toll Free: +1 888 723 4800

Asia Pacific
Honeywell Analytics Asia Pacific Tel:
+82 (0) 2 6909 0300
India Tel: +91 124 4752700
China Tel: +86 10 5885 8788-3000
analytics.ap@honeywell.com

Technical Services
EMEA: HAexpert@honeywell.com
US: ha.us.service@honeywell.com
AP: ha.ap.service@honeywell.com

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THE FUTURE IS WHAT WE MAKE IT

Honeywell

MiniRAE 3000 Datasheet | Rev A | 12/20
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APPENDIX F - BOREHOLE GEOPHYSICS WORK PLAN

NOVA GEOPHYSICAL SERVICES

Subsurface Mapping Solutions
56-01 Marathon Parkway, # 765, Douglaston, NY 11362
Ph. 347-556-7787 Fax. 718-261-1527
www.novagsi.com

July 16, 2025

Sixuan Wang, P.E.
Project Manager
YU & Associates
611 River Drive, 3rd Floor
Elmwood Park, NJ 07407
D: 201.773.9621 **C:** 201.988.3935 E: swang@yu-associates.com

Re: **Geophysical Borehole Logging Work Plan**
Commercial Property
11-35 31st Drive, Long Island City,
Queens County, NY 11106

Dear Ms. Wang:

Nova Geophysical Services (NOVA) presents a work plan to perform a Geophysical Borehole Logging at the above referenced project site: 11-35 31st Drive, Long Island City, Queens County, New York, NY (The "Site").

Geophysical Surveys Objectives down to 60 feet of depth:

- Characterize the bedrock including depth to bedrock, thickness of weathered zones,
- Thickness and characteristic of granular zones,
- Stratification of rock

Borehole Geophysical Survey

Borehole geophysical logging program in five (5) wells at the above-referenced site and each boreholes will be 8-ich core barrel with a 19-inch override casing, the bedrock layer starting from 23-35 ft below ground surface (bgs) and the total depth is from 40-60 ft bgs. The groundwater is estimated at approximately 11 ft bgs.

Borehole Details

- **Number of Boreholes:** 5
- **Depth Range:** 0–60 ft bgs
- **Diameter:** 8 inch

- **Casing/Grouting:** PVC with 19-inch override casing
- **Condition:** Assumes Clean

NOVA will log following data during the survey:

- temperature,
- single-point resistivity,
- spontaneous potential,
- fluid conductivity,
- natural gamma,
- caliper,
- optical televiewer,
- acoustic televiewer, and
- vertical flowmeter measurements (both unstressed and stressed)

Descriptions of each type of recommended log to accommodate the survey purpose are as follows:

Spontaneous Potential (SP) Log
The SP log will be used to identify permeable zones by measuring the natural electrical potential differences between the borehole fluid and the surrounding formation. This method is useful for detecting changes in lithology and locating water-bearing intervals. Its limitations include reduced effectiveness in air-filled or poorly conductive boreholes. SP data will support the identification of transmissive zones when used in combination with resistivity and caliper logs.

Flowmeter Use and Capabilities
A heat-pulse or electromagnetic flowmeter will be used under both **unstressed (ambient)** and **stressed (pumping)**conditions to identify zones of active groundwater flow. The device is capable of detecting low flow velocities (on the order of 0.01 to 0.1 gallons per minute), and measures both the direction and magnitude of vertical flow within the borehole. This will assist in pinpointing inflow/outflow zones and evaluating hydraulic connectivity between fractures or bedding planes.

Data Digitization Software
Collected logging data will be processed, visualized, and interpreted using **WellCAD software** (by ALT). This platform allows for comprehensive log editing, annotation, and presentation, including the generation of composite logs and cross-plots. Data can also be exported in multiple formats for further analysis or integration with other hydrogeologic software.

Expanded Logging Method Descriptions
Each logging method will contribute to achieving the survey objectives as follows:

- **Caliper Log** – identifies borehole diameter variations to detect fractures, voids, and borehole wall collapse.
- **Natural Gamma** – distinguishes lithologic changes and correlates stratigraphy using radioactivity levels.
- **Resistivity Log** – helps differentiate between saturated and unsaturated zones and identifies lithologic boundaries.
- **Acoustic Televiewer** – images borehole walls to map fractures, bedding, and structural orientations.
- **Flowmeter Logging** – identifies transmissive features and their relative contribution to flow.
- **SP Log** – detects electrochemical changes associated with fluid movement and lithologic variation.

Preliminary Data Submission
Preliminary raw data will be compiled and submitted to DEC at the end of each field day. This will include unprocessed logs and summary field notes to facilitate early review and coordination.

Logging Methods and Equipment

The following geophysical tools will be used, each with its purpose:

Logging Method	Purpose	Properties Measured	Limitations
Natural Gamma	Lithologic differentiation (clays vs sands)	Gamma radiation	Sensitive to potassium-bearing minerals only
Resistivity	Identify lithology, fluid content	Electrical resistivity	Affected by borehole diameter, fluid conductivity
Caliper	Borehole diameter and casing integrity	Borehole width	Poor in very soft formations
Fluid Temperature & Conductivity	Locate inflows, stratify aquifer zones	Water temp/conductivity	Real-time needed
Optical/Acoustic Televiewer	Fracture orientation, bedding dips, structural features	Borehole wall images	Needs clear, water-filled hole
Flowmeter (optional)	Identify vertical water movement	Up/down flow rates	Works best in water-filled holes with gradients

Logging Methods and Parameters

Data Processing and Interpretation

Raw geophysical data will be quality-checked, calibrated, and corrected for tool offsets and borehole deviations. Televiewer images will be analyzed to extract structural features. Flowmeter data will be interpreted to identify transmissive zones under static and/or pumping conditions.

Data Presentation

The processed data will be presented in the summary report as:

- Composite well logs with gamma, caliper, and flowmeter profiles.
- Annotated televiewer image logs showing structural features.
- Rose diagrams and stereonets for fracture orientation analysis.
- Flow profiles (ambient and/or pumping) with interpreted transmissive intervals.
- Tables summarizing measured properties and interpreted stratigraphy.

Flowmeter Type and Capabilities
Heat-Pulse Flowmeter

Type: Intermittent measurement device
Technology: Measures the transit time of a heat pulse carried by moving water in the borehole.

Limitations:

- Not suitable for high flow rates (heat pulse dissipates too quickly).
- Requires **calm, water-filled boreholes** with stable temperatures.
- Measurements must be taken at discrete intervals (stationary readings).

if the boreholes do not retain sufficient water after drilling with a **sonic rig**, **you will likely need to fill them with clean water** prior to running tools such as:

- **Optical Televiewer (OTV)**
- **Acoustic Televiewer (ATV)**

- **Flowmeter (especially heat-pulse or electromagnetic types)**

These tools require **clear, stable, and water-filled conditions** for accurate imaging and flow measurements. Dry or partially filled boreholes can lead to:

- Poor image quality (especially for OTV, which requires clear water for camera visibility)
- Invalid or distorted flowmeter readings
- Inability to maintain tool centralization and coupling for televiewers

Recommended Action:

"In the event that boreholes do not retain sufficient water post-drilling, the holes will be filled with clean water to ensure optimal conditions for borehole logging, particularly for televiewer and flowmeter tools."

QA/QC Procedures

- All logging will be performed by trained geophysicists.
- Repeat logging in test intervals will ensure data reproducibility.
- Calibration checks will be performed daily.

Health and Safety

- All work will be performed in compliance with [e.g., OSHA 29 CFR 1910 and 1926].
- Safety tailgate meetings will be held daily.
- Confined space, water hazard, and electrical safety protocols will be observed.
- Proper PPE (gloves, safety boots, hard hats, etc.) will be used at all times.

Deliverables

- Geophysical logs in PDF and LAS formats
- Interpretation report including lithologic correlations and hydrogeologic insights
- Recommendations for further investigation or construction

Schedule

Task	Estimated Duration	Start Date	End Date
Mobilization	1 day		
Logging	3 days		
Data processing & interpretation	3 days		
Reporting	3–5 business days		

Assumptions made by NOVA are that:

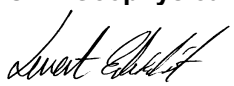
- The wells will be drilled by others prior to NOVA's onsite arrival, and will be at least 4" in diameter with a stickup or no more than 24 inches above ground surface (note that if the stickup exceeds 24 inches, please notify us prior to initiation of the field survey so appropriate equipment can be mobilized);
- The wells will be thoroughly developed (e.g. flushed, etc.) by others and be allowed to equilibrate a minimum of 24 hours prior to the initiation of logging.
- The wells will be free of floating product, pumps, liners, or other obstructions prior to NOVA's onsite arrival (client is responsible for removal and replacement of pump/monitoring equipment).
- And the work will be conducted in Level D health and safety gear.

Reporting

As a final product, NOVA will provide digital copies of the geophysical logs (fluid suites and caliper) on-site (at the client's request), as well as a list of significant features. NOVA will also prepare an electronic written report describing the survey methodologies and results.

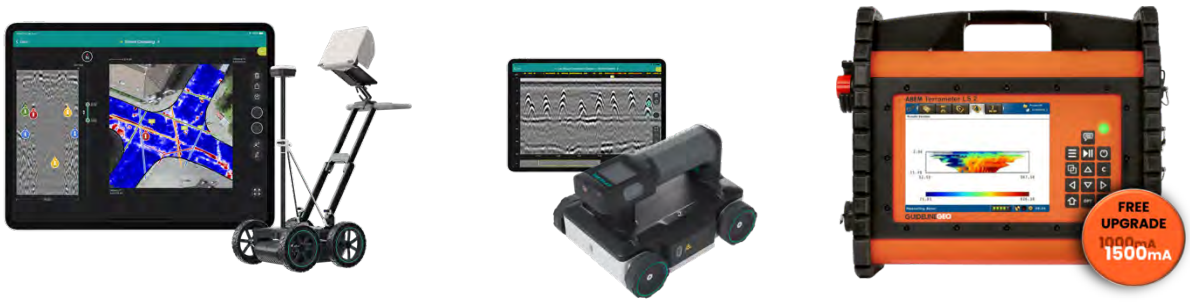
If you have any questions concerning the scope of work outlined in this proposal, please contact us
Sincerely,

NOVA Geophysical Services



Levent Eskicakit, P.G., E.P.
Project Manager

QUALIFICATION PACKAGE
GEOPHYSICAL ENGINEERING SERVICES



MAY 2025

NOVA GEOPHYSICAL SERVICES

SUBSURFACE MAPPING SOLUTIONS

56-01MARATHON PARKWAY, PO BOX # 765, DOUGLASTON, NEW YORK 11362
Phone:347-556-7787 Email:info@novagsi.com
www.novagsi.com
A Lece Corporation

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8. GEOPHYSICAL SURVEY SITE PLAN

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INTRODUCTION

Nova Geophysical Services (NOVA) is a professional firm established in 2005 offering services in Environmental Geophysical Engineering and Surveying Services. We provide these services for both public and private sector clients at sites located throughout the United States.

NOVA conducted environmental geophysical engineering services at brownfields, former MGP sites, Power Stations, Environmental due diligence subsurface investigations, and historic sites.

NOVA also specializes in surface and borehole geophysical surveys, including seismic testing, seismic reflection, seismic refraction, ground penetrating radar (GPR), electromagnetic survey (EM61), borehole logging, and geophysical logs. NOVA additionally provides comprehensive subsurface utility location (CSUL).

NOVA owns and operates the highest quality of geophysical instruments in subsurface radar technology with dedication of its technical staff, who are continually using the state-of-the-art technologies to provide accurate and precision services to our client needs. NOVA also collaborates on projects with nations leading universities.

Services typically provided include:

Geophysical Engineering Services

Environmental Geophysics

Engineering Geophysics

Archeological Geophysics

Construction / Engineering

Environmental Audits and Site Assessment

Evaluation of Active / Inactive Industrial Sit

Public / Private Remedial Investigations and

Geotechnical

Environmental Audits and Site Assessment

Groundwater: Mapping and Plume Delineation

Utility Location

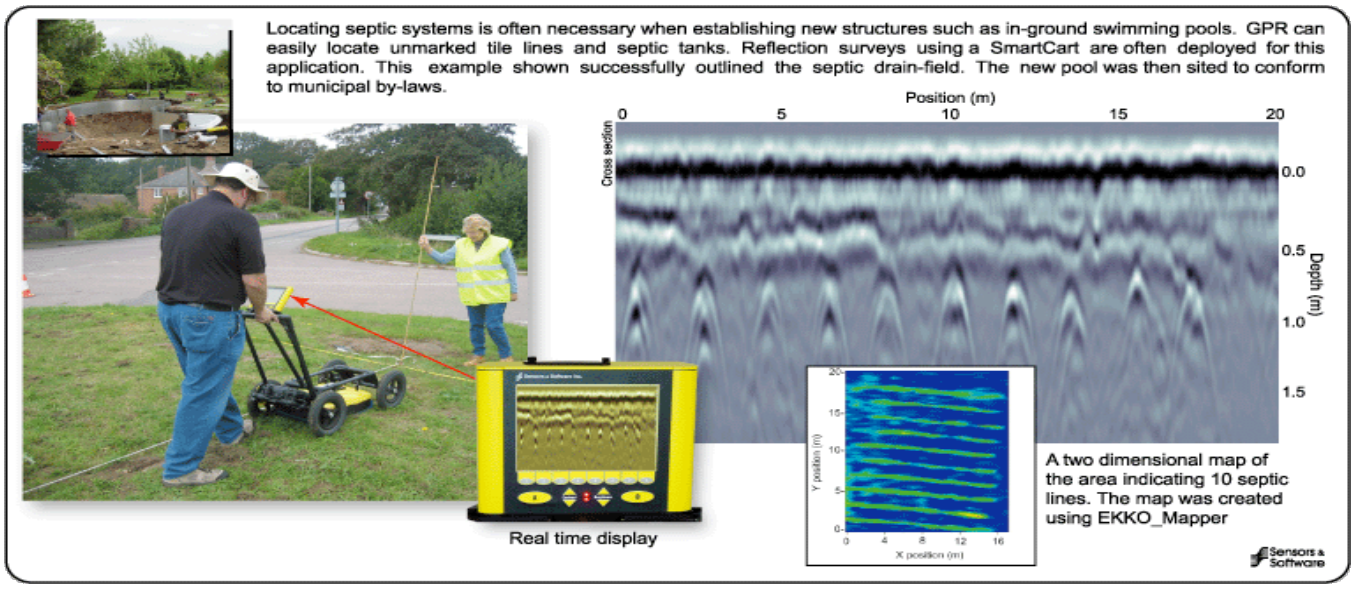
Subsurface Mapping

Ground Penetrating Radar (GPR)

NOVA utilizes the world's finest Ground Penetrating Radar Systems in subsurface radar technology with dedication of its technical staff, who are continually using state-of-the-art technologies. Nova also collaborates on projects with leading universities and national laboratories.

In a ground penetrating radar (GPR) survey, radio-frequency electromagnetic pulses are transmitted into the subsurface and are reflected back to the surface at boundaries where there is a change in dielectric permittivity. These boundaries generally correlate well to subsurface material changes in a fresh water environment, as the dielectric permittivity of a material is predominately a function of it's water content. Where present, boundaries such as water bottom - soft sediment, soft sediment - hard sediment, and sediment - bedrock, are often good GPR targets,making GPR a practical tool to rapidly determine bathymetry and profile the sub-bottom in most fresh water bodies.

The penetration achieved with GPR depends primarily on the electrical conductivity of the subsurface materials (the water, and the underlying sediments and rock), and the GPR antenna frequency used. Lower frequencies penetrate deeper, but a lower resolution image is obtained than would be with higher frequencies. Accordingly, a range of antenna frequencies (typically 25 to 500 MHz) are mobilized and field tested in order to ensure that optimal results are obtained in the particular survey environment.



REQUIREMENTS & PROCEDURES

The GPR method provides a very rapid means of non-intrusive data collection. The system is most commonly moved along the surface at a consistent pace as data are collected continuously along profiles. The depth at which a feature can be imaged is largely dependent on subsurface material type (resistive versus conductive). With prior knowledge of expected subsurface materials and clearly defined objectives, an experienced operator can optimize data collection parameters to compensate for less than ideal geologic environments.

NOVA GEOPHYSICAL SERVICES

Environmental Consulting & Engineering Solutions

56-01 Marathon Parkway, # 765, Douglaston, New York 11362

Ph. 347-556-7787 Email. info@nova-gsi.com

www.novagsi.com.com

SCREENING EAGLE | proceq



Subsurface Mapping GPR

GS8000

Proceq GPR Subsurface App
Tech Specs

Measurements modes	Line Scan Grid Scan Free Path
Visualization modes	A-scan Line Scan Line Scan migrated Time Slice View Map View Augmented Reality
On-site annotations	Tags Markers Photos Points of interest Voice notes Markups Linework
Display settings	Slice depth and thickness Auto / linear / time gain Background removal Multi-layer dielectric constant Time window Noise cancellation filter Frequency filter Low pass filter Color palette Object layers
Reporting	Workspace integration Automatic logbook Instant map / drawing generation Instant report generation Share via url
Export format	SEG-Y DXF SHP KML HTML
Coordinate System	EPSG global database Local grid models Geoid models
Languages	English Spanish French German Italian Chinese
Display unit	Any iPad® or iPad Pro® [1] Recommended: iPad Pro WiFi + Cellular Screen resolution: up to 2732 x 2048 pixels Storage capacity: up to 1 TB

iPad is a trademark of Apple Inc.; iOS is a registered trademark of Cisco in the US and is used by Apple under license

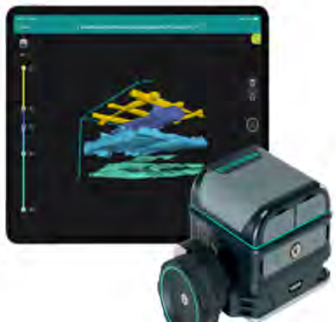
Download on the App Store

Instrument
Tech Specs

Radar technology	Stepped-frequency Continuous-Wave GPR
Modulated frequency range	40 – 3440 MHz
Effective bandwidth	3200 MHz
Min. detectable target size	1 cm | 0.4 in [2]
Max. time window	200 ns
Scan rate	500 Hz
Spatial interval	Up to 100 scans/m
Acquisition speed	Up to 80 Km/h | 50 mph [3]
GNSS receiver	Multiband GPS + Glonass + Galileo + Beidou SSR augmentation / NRTK-compatible [4] Dimensions: 145 x 145 x 70 mm Weight: 0.7 Kg, 4x AA-batteries included
GNSS real-time 3D accuracy	Typ. 1 - 5 cm | 0.5 - 2 in [5]
GNSS initialization time	Typ. 5 - 30 s
Wheel encoders	2
Configurations	Proceq GS8000 Lite Proceq GS8000 Pro [6]
Weight	24 Kg [7]
Dimensions	61 x 57 x 38 cm [8]
Antenna positions	Ground-coupled with dual-axis floating Air-coupled with 25 mm clearance [9]
Ingress protection (IP) / sealing	IP65
Power supply	Removable flight-safe battery pack [10] | Off-the-shelf power bank [11]
Autonomy	3.5 hours | Full working day [12]
Operating temperature	-10° to 50°C | 14° to 122° F
Operating humidity	<95% RH, non-condensing
Connectivity	WiFi, Ethernet, USB-A, USB-B, USB-C, Lemo [13]

1. Running an up-to-date iOS version; recommended models: iPad Pro® WiFi + Cellular 11" or 12.9"
2. Metallic object buried at 0.3 m / 1 ft, in average soil conditions
3. At 50 mm scan interval
4. Needs an active Internet connection on the iPad; SSR service available in Europe, USA, southern Canada, southeastern Australia and South Korea / NRTK corrections via NTRIP in RTCM3 format
5. Via NTRIP RTK or SSR corrections; the achieved accuracy is subject to atmospheric conditions, satellite geometry, observation time, etc.
6. GS8000 Pro includes additionally: off-road wheels and underbody, GNSS pole fixation kit, tablet cover for sun and rain, hard transportation case
7. For GS8000 Pro configuration: 27 Kg
8. For GS8000 Pro configuration: 68 x 60 x 42 cm
9. For GS8000 Pro configuration: 40 mm
10. Contains 8x rechargeable C-Type NiMH batteries
11. USB-C PD power bank with max. dimensions: W 85mm x H 28mm (recommended power: 12V/>=1.25A or 15V/>=1A)
12. Recommended battery capacity: >4500 mAh | Recommended power bank capacity: >20000 mAh
13. For terrestrial positioning systems, an intermediate serial adapter to DB9 might be needed to output Pseudo NMEA GGA positions

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AR

Proceq Ground Penetrating Radars

GP8800

Concrete inspections and structural imaging with SFCW ground penetrating radar technology now fits at the palm of your hand

- Superior insights thanks to unparalleled depth and clarity of data from the powerful probe
- Easy to learn and to operate with our user-friendly, feature-rich, intelligent software
- Unmatched productivity through user-centric inspection ergonomics and digital workflow

Applications:

Congested rebar configurations / Areas close to walls & underneath pipes / Irregular and curved surfaces / Concrete Quality Assessment

Proceq GPR App
Tech Specs

Measurement modes	Superline Scan (1000m / 3281 ft) Area Scan (with Flexible Grid up to 100m2 / 1076 ft2)
Review modes	Superline scan[1] A-scan (incl. envelope) Migrated view Non-migrated view Split view[1] Time-Slice view[2] Basic 3D view AR
Advanced visualization	Time-Slice view Pro 3D view Augmented Reality (AR)

Download on the



Instrument
Tech Specs

Radar technology	Stepped-frequency continuous-wave (SFCW) GPR
Modulated frequency range	400 – 6000 MHz
Penetration depth	65 cm / 25.6 in
Battery	Flight-safe, removable pack, 4x AA (NiMH)
Dimensions	8.9 x 8.9 x 7.6 cm 3.5 x 3.5 x 3 in
Weight	487 g / 17.2 oz (excl. battery pack)

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SmartCart®



Mode of Operation:

The SmartCart® provides a self-contained, mobile platform for transporting the NOGGIN® and DVL for fast, efficient data acquisition over smooth to moderately rough terrain.

SmartCart® features:

- A wheel odometer to trigger data acquisition at default or user-defined intervals (step size) to provide uniform data coverage.
- A bi-directional odometer that triggers data acquisition in one direction and, in the other direction, provides a back-up arrow to easily pinpoint the location of objects found on the survey line.
- Sensors & Software's unique DynaQ® feature automatically adjusts data acquisition rates to the survey speed; providing dynamic stacking to maximize data quality.

Options:

- GPS to provide geo-referenced coordinates linked to the data
- Brackets to quickly swap between the NOGGIN® 100, 250, 500 and 1000 sensors

EQUIPMENT

NOVA operates two GPR systems, a Sensors and Software Noggins and MALA RAMAC X3M GPR. The MALA GPR system operates with a higher frequency range and is used when very near surface high resolution data is required. With shielded antenna to help eliminate above ground reflections, this system is well adapted for delineating features such as utilities and USTs in cluttered urban environments. The Noggins system addresses the problem of ineffective penetration depth. This highly advanced digital recording system is capable of operating at relatively low frequencies with very high pulsing power resulting in maximum depths of investigation.





Electromagnetic Surveying (EM)

The electromagnetic (EM) technique utilizes differences in the electrical properties of geologic materials to map subsurface conditions. An electric current is induced into the ground by a loop of wire laid out on the ground surface. These induced currents propegate downward into the subsurface and are increasingly influenced by the electrical properties of deeper layers. A series of measurements of the secondary magnetic field are used to model electrical resistivity as a function of depth. Changes in subsurface resistivity values can result from changes in lithology, water content, pore-water chemistry, and the presence of buried debris.

APPLICATIONS

- Mapping of aquifer extent, thickness, and waterbearing potential.
- Mapping aquifer boundary units, such as aquitards and bedrock.
- Mapping saltwater intrusion into coastal aquifers.
- Delineation of contaminated groundwater.
- Mapping zones of mineralization.
- Delineation of fault zones.
- Mapping sand and gravel resources.
- Mapping subsurface conditions for geotechnical design.
- Detecting buried debris. Locate buried metallic objects (drums, tanks, etc). Map leachate plumes

PRODUCTS

Recommended drilling locations.

- Plan view maps or cross-section showing depth and extent of interpreted subsurface units or anomalous zones.
- Modeling analysis of data and interpretation.

BENEFITS

Provides greater vertical and lateral resolution. · Utilizes a small survey area relative to the depth of penetration achieved. · Easily calibrated to existing boreholes. · Optimizes the location of water supply wells in areas of highest potential. · Guides the placement of geotechnical borings and monitoring wells.

SURVEY REQUIREMENTS

- Best used in open or wooded areas free of utilities, fencelines, power lines, and severe topography.
- Depth of penetration ranges from one to three times the transmitter loop diameter
- Vertical resolution is generally 10% of the transmitter loop diameter.
- The data acquisition is non-intrusive and nondestructive.

COMPREHENSIVE SUBSURFACE UTILITY LOCATION

Utility Mapping & Detection

NOVA utilizes electromagnetic (EM) and other highest quality utility locating instruments. The equipped with suitable antennas can be used for almost any subsurface utility engineering or locating project by detecting non-metallic or non-conductive utilities such as PVC, or other plastics, concrete, terracotta, and more. The listed applications below are just a few examples where the Easy Locator can be successfully used.

- Plastic Gas pipes
- Sewer and water lines
- Telecom fiber
- Electric
- Natural gas
- Fuel

Performance of a Subsurface Utility Engineering or locating project involves:

- Review of all existing drawings to get an idea of what you can expect to find.
- Visual Inspections of manholes to get a more precise idea of pipe diameters, depths and general direction pipes are heading.
- Use of Electro Magnetic methods to locate and trace metallic/conductive utilities.
- Use of Ground Penetrating Radar to scan the area for unknowns and non-conductive utilities and other unknown obstructions.
- Perform vaccum excavation to verfiy utiltiy locations and determine the exact depth, size, and material type of a utility.

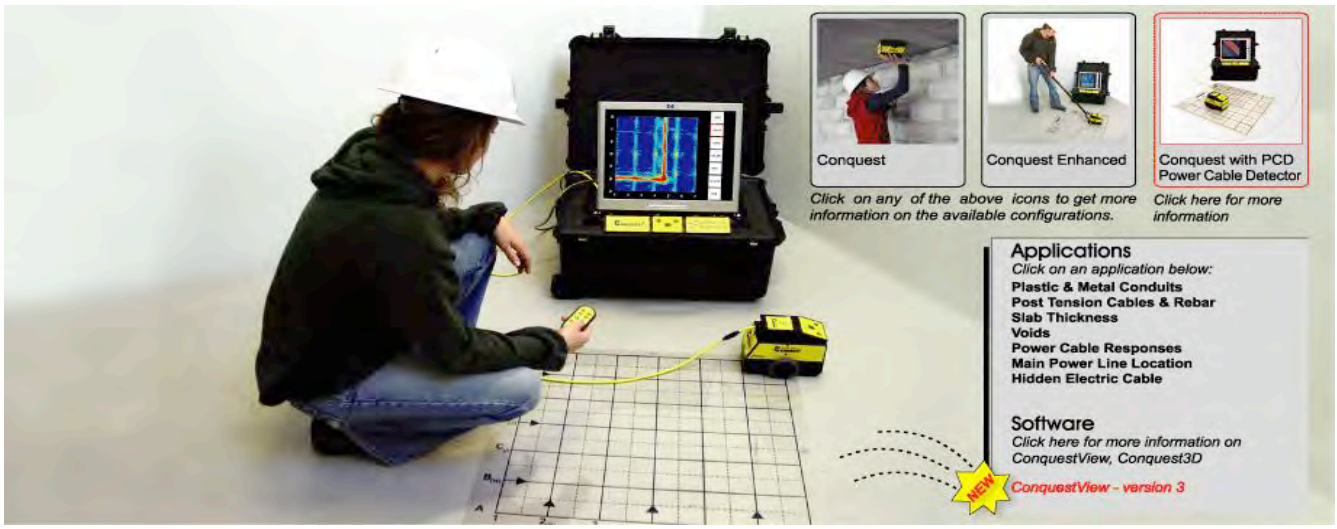
NOVA utilizes different utility location instruments and GPR to provide a comprehensive on-site utility mark out.

CONQUEST CONCRETE IMAGING (By Software& Sensors)

Nova uses Software and Sensor's Conquest system to provide concrete images in minutes, before cutting or drilling.

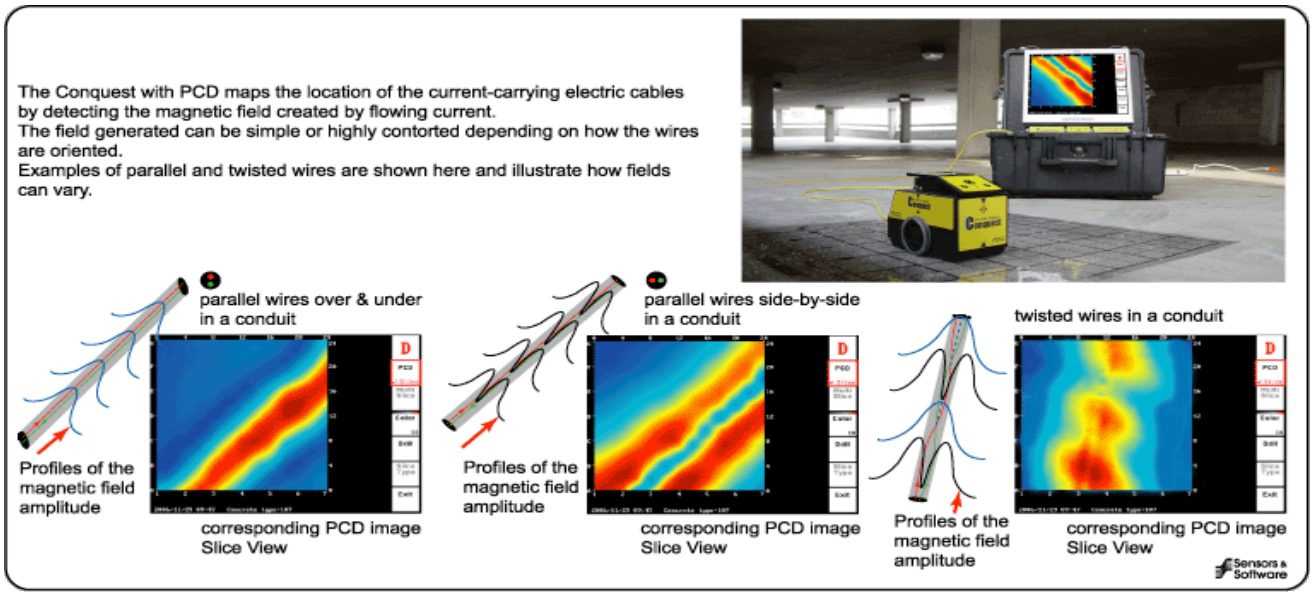
NOVA uses Conquest to: locate rebar, plastic and metal conduits locate and estimate depth of post-tension cables determine cover depth detect deterioration discover voids and more The easy-to-use, portable unit can quickly survey floors as well as walls, ceilings, and other hard-to-access areas.

NOVA quickly surveys floors as well as walls, ceilings, and other areas using Conquest units.



Use Conquest to:

- Locate metallic and none metallic conduits
- Locate and estimate depth of cables & utilities
- Determine cover depth
- Detect deterioration
- Discover voids and others



Borehole Logging

Borehole GPR is a powerful tool often used to obtain information at depth for formation characterization. Borehole radar can be used in different modes; reflection, cross hole, and surface-to-borehole. Typical applications include Fracture Characterization, Foundation Studies, Karst Evaluation and Cavity Detection.

In reflection mode the transmitter and receiver are deployed in the same borehole. The antennas are dipoles and radiate and receive reflected signals omni-directionally. Data is displayed in real time MALA's / NOGGIN's using GroundVision software and sensor's software, respectively. To determine the exact distance and bearing of the reflector in this mode requires scans in at least three boreholes.



Video Inspections

Video inspections provide a continuous, permanent visual record of the well casing, screen, or open hole. A video camera built into a waterproof stainless steel housing is lowered into the well via a triple-armored coaxial cable. The image is transmitted back via the cable to a VHS recorder and monitor at the surface. This arrangement provides a permanent videotape recording, as well as real-time viewing, which facilitates detailed inspections of features of interest. The RVC-360 is a new generation borehole video system. The fuzzy, monochromatic picture characteristic of older borehole cameras has been replaced by a remarkably sharp, full-color image. The joystick-controlled articulating lens allows either a close look at the side of the well or a wide-angle axial view, all in a single run. These remarkable capabilities have proved extremely useful in providing detailed screen inspections, identifying cracks and holes in casings, delineating fracture zones and ground water flow, evaluating specific formations for aquifer development, and locating lost tools and equipment

PERSONNEL

NOVA's employees are organized into self-contained project teams. Our employees are encouraged to develop professionally and maintain themselves at the leading edge of technological development. All our professionals hold engineering and/or related university degrees, and have graduate degrees from the nation's most advanced graduate programs.

QUALITY CONTROL AND ASSURANCE

Quality Control and Assurance is our goal. The use of experienced professional personnel provides the client with the highest quality, total coordination, and control of project costs and schedules from inception to completion. Construction techniques, materials, and equipment are continually becoming more sophisticated due to the complexity of projects undertaken and the use of marginal land. We provide effective Quality Control and Assurance of projects through an understanding of both the technical aspects of design and the practical limitations of construction.

In addition, our in-house Quality Assurance Panel of senior principals will provide conceptual development and quality control to ensure that our clients receive the highest quality of innovative input and engineering services it demands and deserves. The vast experience of these senior principals will be instrumental in providing creative and practical solutions while overseeing the development of these ideas from conceptualization through construction.

HEALTH AND SAFETY

NOVA is committed to protecting the safety and health of our employees by providing a workplace that is conducive to the prevention of injuries and illnesses. The safety and health of our employees continues to be the first consideration in the operation of the business. Systems are in place for identifying and managing safety and health risks, for complying with all applicable laws and regulations, and for educating and training our workforce in the relevant safety issues. Safety performance indicators (OSHA Total Incident Rate, OSHA Lost Workday Case Rate, and Experience Modification Rate – EMR) continue to trend favorably downward.

GEOPHYSICAL SURVEY REPORT

(TO BE USED AS AN EXAMPLE)

GEOPHYSICALENGINEERING SURVEYREPORT

Marlboro Houses
Avenue X and West 11th Street,
Brooklyn, New York 11223

NOVA PROJECT NUMBER:
24-1851

DATED:
January 31, 2025

PREPARED FOR:

NV5
800 Lanidex Plaza, Suite 300
Parsippany, New Jersey 07054
P: 973.946.5653| F: 973.984.5421

PREPARED BY:

NOVA
GEOPHYSICAL
ENGINEERING
Subsurface Mapping Solutions
56-01 Marathon Parkway # 765
Douglaston, New York 11362
347-556-7787 (PHONE)
718-261-1527(FAX)
www.nova-gsi.com

NOVA GEOPHYSICAL SERVICES

SUBSURFACE MAPPING SOLUTIONS
56-01 Marathon Parkway #765, Douglaston, New York 11362
Ph. 347-556-7787 Fax. 718-261-1527
www.novagsi.com

January 31, 2025

James E. Huselton, PE, PP
Chief Engineer/Sr. V.P.
NV5
800 Lanidex Plaza, Suite 300
Parsippany, New Jersey 07054
P: 973.946.5600|E: James.Huselton@nv5.com

Re: Geophysical Engineering Survey (GES) Report
Marlboro Houses
Avenue X and West 11th Street,
Brooklyn, New York 11223

Dear Mr. Huselton,

Nova Geophysical Services (NOVA) is pleased to provide the findings of the geophysical engineering survey (GES) at the above referenced project site: Avenue X and West 11th Street, Brooklyn, New York 11223 (the "Site").

INTRODUCTION TO GEOPHYSICAL ENGINEERING SURVEY (GES)

NOVA performed a geophysical engineering survey (GES) consisting of a Ground Penetrating Radar (GPR) and Electromagnetic (EM) survey at the site. The purpose of this survey is to locate and identify utilities, subsurface main sewer structure, underground storage tanks (USTs) and other substructures on JANUARY 24th, 25th, and 26th 2025.

The equipment selected for this investigation was a Sensors and Software Noggin 250 MHz ground penetrating radar (GPR) with a shielded antenna, Sensors and Software 100 MHz GPR with an unshielded antenna, GSSI UtilityScan 350 MHz GPR with a shielded antenna, and a Radio Detection RD7100 Electromagnetic utility locator.

A GPR system consists of a radar control unit, control cable, and transducer (antenna). The control unit transmits a trigger pulse at a normal repetition rate of 250 MHz. The trigger pulse is sent to the transmitter electronics in the transducer via the control cable. The transmitter electronics amplify the trigger pulse into bipolar pulses that are radiated to the surface. The transformed pulses vary in shape and frequency according to the transducer used. In the subsurface, variations of the signal occur at boundaries where

there is a dielectric contrast (void, steel, soil type, etc.). Signal reflections travel back to the control unit and are represented as color graphic images for interpolation.

A typical electromagnetic (EM) utility locating system consists of a transmitter unit and a receiver unit. The receiver unit can be used independently of the transmitter unit in order to detect utility lines with an inherent EM signature (electric utility lines, water lines, etc.). If needed a current at a specific frequency can also be placed on a utility that is being located. This can be done via the transmitter unit by either direct connection or induction via an EM field varying at specific frequency. The receiver unit is then set to the selected frequency and the electromagnetic field created by the current running through the utility can be located allowing the utility to be marked.

GEOPHYSICAL METHODS

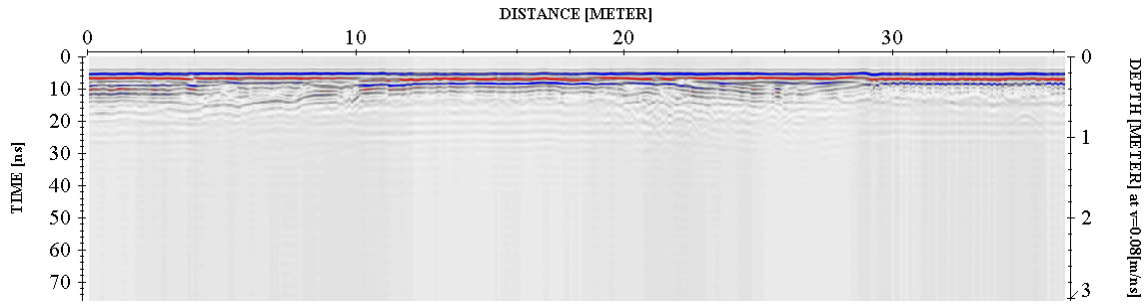
The project site was screened using GPR to search the specified area and inspected for reflections, which could be indicative of substructures and utilities within the subsurface. An EM utility locator was used to help determine the locations of utilities within the survey area.

EM data was collected and interpreted on site and suspected utilities marked as needed. GPR data profiles were collected for the areas of the Site specified by the client and processed as specified below.

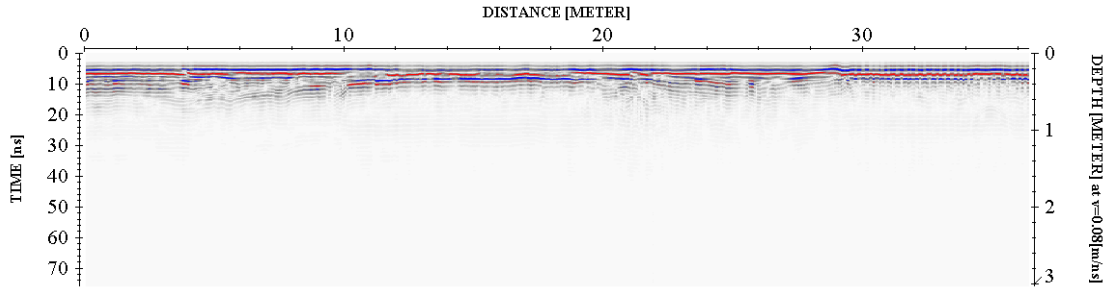
DATA PROCESSING

In order to improve the quality of the results and to better identify anomalies NOVA processed the collected data. The processing work flow is briefly described in this section.

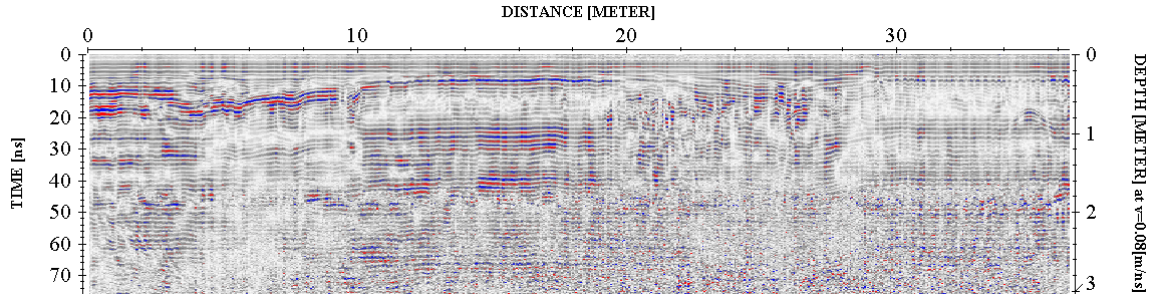
Step 1. Import Raw RAMAC data to standard processing format



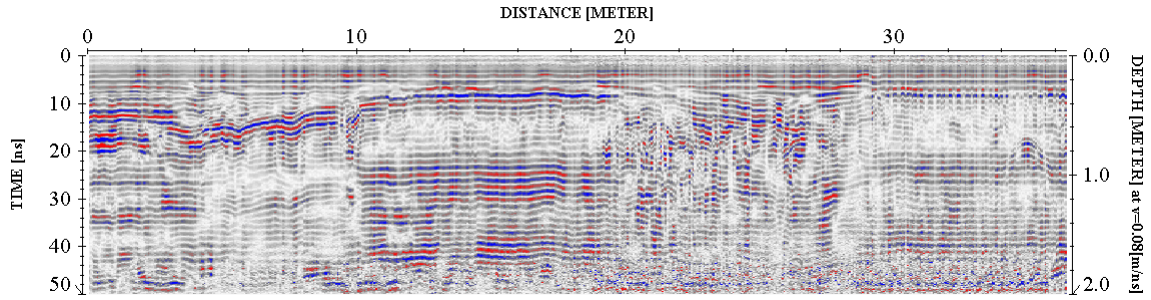
Step 2. Remove instrument noise *(dewow)*



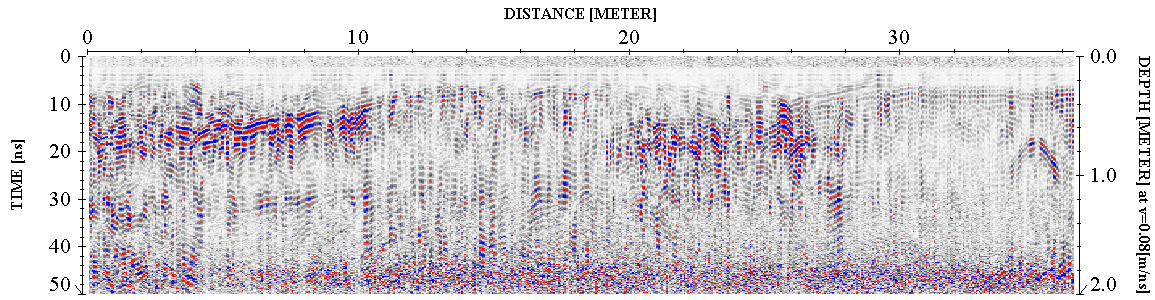
Step 3. Correct for attenuation losses *(energy decay function)*



Step 4. Remove static from bottom of profile *(time cut)*



Step 5. Mute horizontal ringing/noise *(subtracting average)*



The above example shows the significance of data processing. The last image (step 5) has higher resolution than the starting image (raw data – step 1) and represents the subsurface anomalies much more accurately.

PHYSICAL SETTINGS

NOVA observed the following physical conditions at the time of the survey.

Weather: Clear

Temperature: 80° F

Surface: Concrete, Asphalt, Vegetation

Geophysical Noise Level (GNL): The GNL was high at the site. The noise was a result of the site being located in an urban environment.

RESULTS

The results of the geophysical engineering survey (GES) identified the following at the project site:

- Anomalies resembling potential subsurface utilities (such as electric, water and drainage) were identified during the GES. Shown in Geophysical Images.
- A large geophysical anomaly resembling a suspected sewer outfall was identified at a depth of approximately 3.5’ to 5.5’ during the GES.
- All detected subsurface anomalies were marked in the onsite mark out.
- All cleared boring locations were marked in the onsite mark out.

If you have any questions, please do not hesitate to contact the undersigned.

Sincerely,

NOVA Geophysical Services



Levent Eskicakit, P.G., E.P.

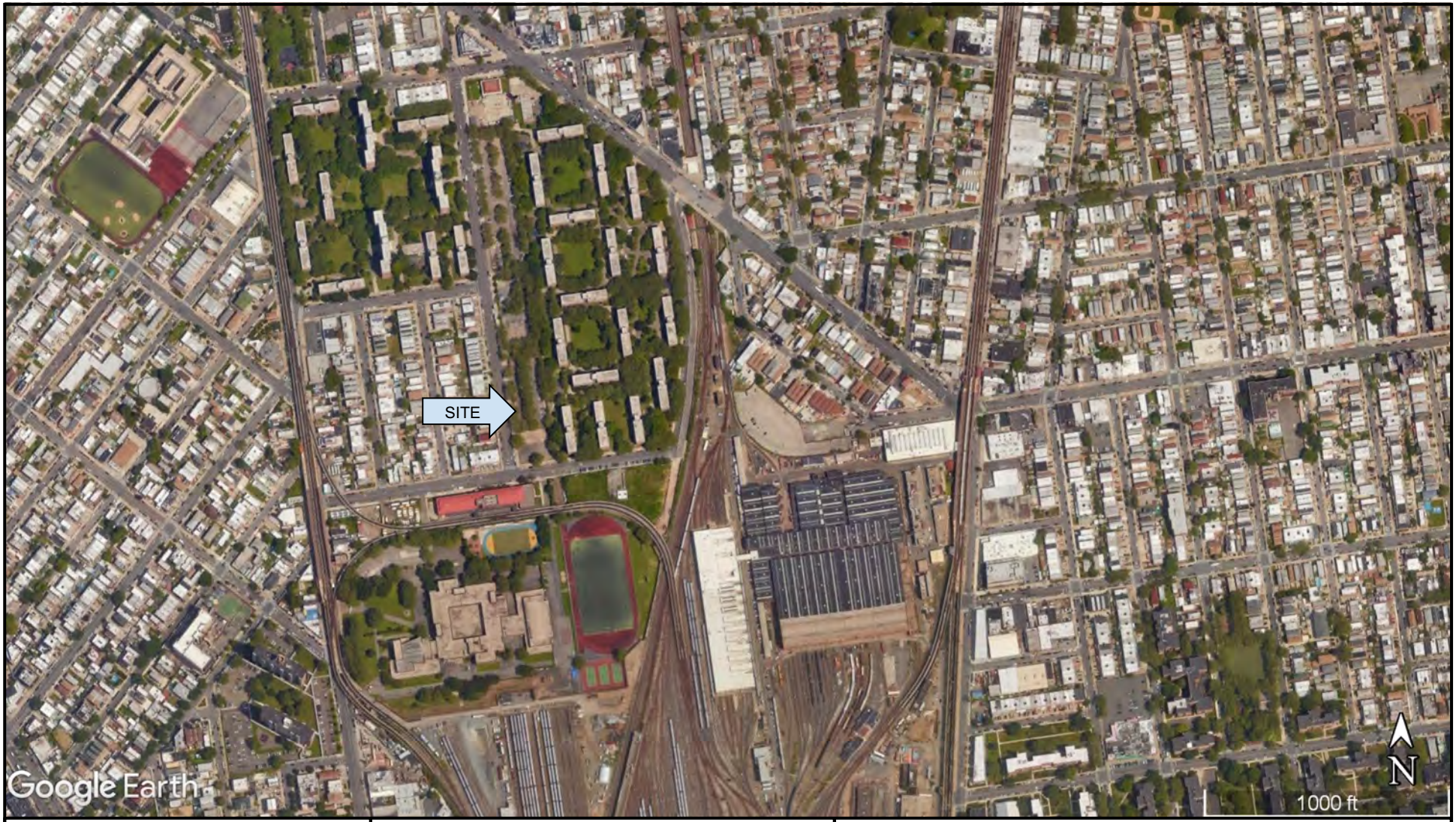
Project Manager

Attachments:

Location Map

Geophysical Survey Plan

Geophysical Images



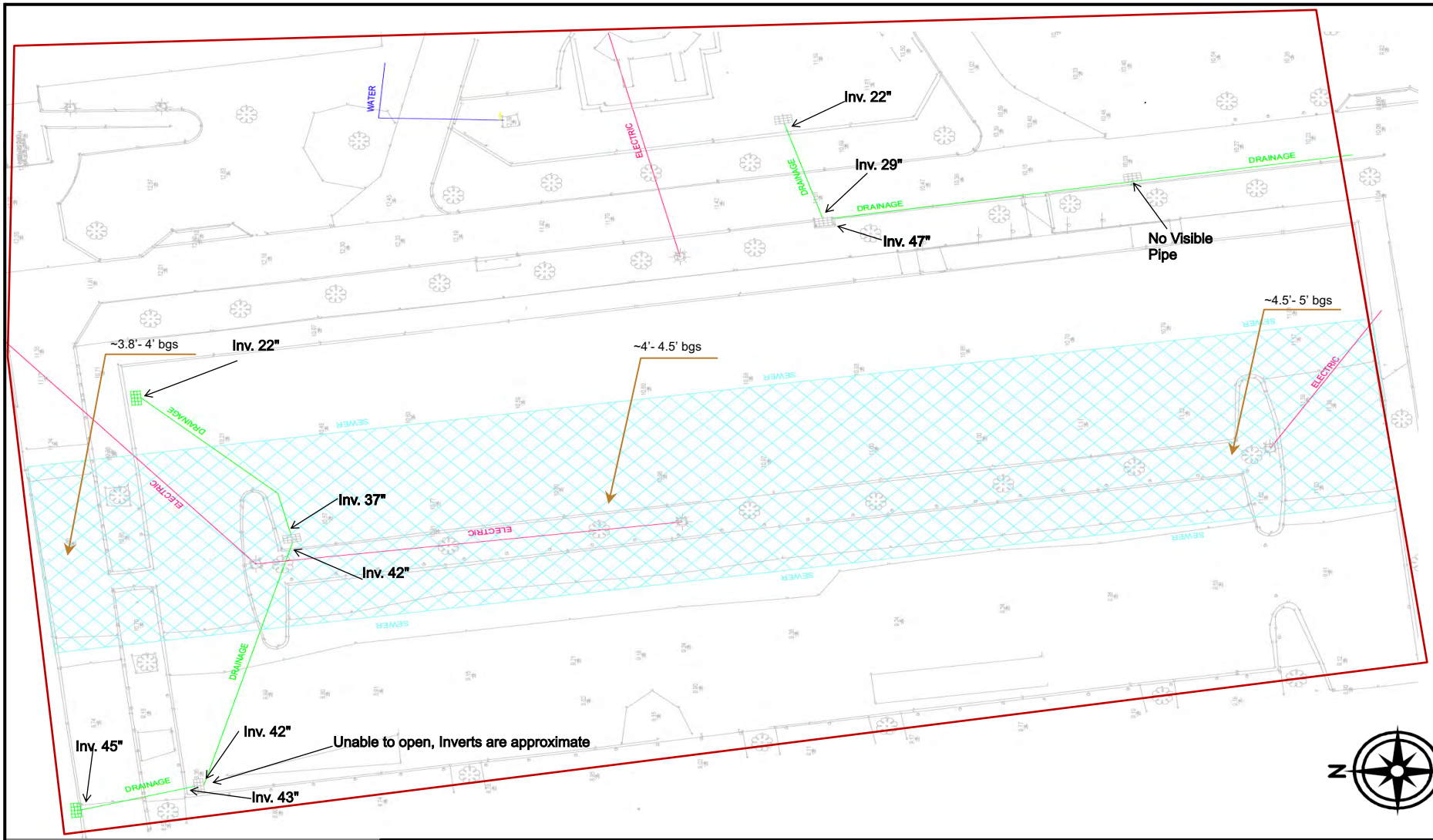
NOVA Geophysical Services

Subsurface Mapping Solutions
56-01 Marathon Parkway, # 765
Douglaston, New York 11362
Phone (347) 556-7787 * Fax (718) 261-1527
www.novagsi.com

Location Map

SITE:	**Marlboro Houses** Avenue X and West 11th Street, Brooklyn, New York 11223
CLIENT:	NV5
DATE:	January 24th, 25th & 26th, 2025
AUTH:	Chris Steinley

LEGEND



NOVA
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Douglaston, New York 11362
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www.novagsi.com

SURVEY PLAN

SITE:	**Marlboro Houses** Avenue X & West 11th Street Brooklyn, New York
CLIENT:	NV5 & NYCDDC
DATE:	January 24th, 25th & 26th, 2025
AUTH:	Levent Eskicakit / Chris Steinley

LEGEND

- Survey Area
- Water
- Electric
- Drainage Line
- Subsurface Sewer Structure
- ~3.8'- 4' bgs — Approximate Depth to top of the Subsurface Sewer Structure

GEOPHYSICAL IMAGES

Marlboro Houses

Avenue X and West 11th Street,
Brooklyn, New York 11223
January 24th, 25th & 26th, 2025









GEOPHYSICAL IMAGES

Marlboro Houses

Avenue X and West 11th Street,
Brooklyn, New York 11223
January 24th, 25th & 26th, 2025









GEOPHYSICAL IMAGES

Marlboro Houses

Avenue X and West 11th Street,
Brooklyn, New York 11223
January 24th, 25th & 26th, 2025









RESUMES

NOVA GEOPHYSICAL SERVICES

Levent Eskicakit, P.G, E.P.
Principal

PROFESSIONAL SUMMARY

Mr. Eskicakit is the principal and owner of NOVA Geophysical Services. As a Principal, he oversees projects, contracts, and responsible to maintain the highest quality of the NOVA's services. Mr. Eskicakit is an Environmental Engineer with over 18 years of experience in soil and groundwater investigation and remediation experience at hundreds of sites, including municipal solid waste landfills, proposed new school construction sites, inactive hazardous waste disposal sites, former manufactured gas plant sites, leaking underground storage tank (UST) sites, and various commercial and industrial properties. Mr. Eskicakit is fully versed in New York State Department of Environmental Conservation (NYS DEC) and New York City Department of environmental Protection (NYC DEP) regulations and investigation procedures, and has experience working under the New York State Voluntary Cleanup Program and Brownfield Cleanup Program. Mr. Eskicakit has also managed assignments throughout South and North America, and southeast Europe.

EDUCATION

M.S., Environmental Engineering/Management, Adelphi University, 1993
A.S., Environmental Engineering, Queens College, CUNY, 1991
B.S., Environmental/Geophysical Engineering, Cukurova University, 1989

WORK EXPERIENCE

- 1992 – Laurel Environmental Associates, Environmental Engineer
- 1998 – ATC Associates Inc., Senior Project Manager/Subsurface Group Manager
- 2003 – Langan Engineering and Environmental, P.C., Project Manager
- 2006 to Present – Nova Geophysical Engineering Services, Principal

PROFESSIONAL REGISTRATION

European Union Environmental & Geophysical Engineers Association
National Groundwater Association
American Geophysical Society
Professional Geologist, New Hampshire
Environmental Professional (Registration # 1206)

TRAINING AND CERTIFICATIONS

- OSHA 40 Hour
- Confined Space Entry
- ASTM Risk Based Corrective Action for Petroleum Contaminated Sites
- Porfessional Geologist State of New Hampshire
- Professional Environmental Engineer, TMMOB (Turkey)

PROFESSIONAL ACTIVITIES

- National Ground Water Association
- European Union Environmental Engineer Association
- Environmental Engineer Association of North America
- Environmental Engineer Associate of Turkey
- Professional Geologists Association of Long Island
- Professional Geophysicist Association of North America

NOVA GEOPHYSICAL SERVICES

Christopher R. Steinley

GEOPHYSICIST

Performs near surface geophysical surveys including GPR, EM and UXOs.

EDUCATION

Texas A&M University, College Station, TX
Bachelor of Science, Geophysics, May 2016
Minor in Mathematics
GPA: 3.55/4.0, Cum Laude

RESEARCH EXPERIENCE

Texas A&M University, College of Geosciences, College Station, TX, August ’15-May ’16
Research Assistant (PAID)

- Assisted Dr. Mark Everett in research on imaging bridge piles for the Federal Highways Administration
- Conducted **electrical resistivity tomography** and **induced polarization** experiments
- Involved in instrument setup, data collection, and analysis of geophysical data

Texas A&M University, College of Geosciences, College Station, TX, Sept ’14-May ’15
Research Assistant

- Supplied PH.D candidate Pin Shuai with requested geophysical data.
- Collected **frequency domain electromagnetic induction** and **ground penetrating radar** data for use in the estimation of hydrogeologic parameters.
- Analyzed data using matlab.

PRESENTATIONS

Student Research Symposium, Texas A&M University Department of Geology and Geophysics
”Automatic Delineation of Faults using Edge Enhanced Volumes,” Spring ’15

- Created programs in Petrel to delineate faults in **seismic** data with little to no human interaction
- Used Visual Basic for Applications to create a user interface for the programs

COMPUTER SKILLS

Proficient programming skills in FORTRAN, PYTHON, MATLAB and EXCEL.

RELEVANT COURSEWORK

Near Surface Geophysics - GEOP 413 - Fall ’14
Geophysical Inverse Theory - GEOP 620 - Fall ’15
Theory of Partial Differential Equations - MATH 412 - Summer ’15

HONORS AND AWARDS

Dean’s List of Distinguished Students Fall ’14, Spring ’15
Top 10% Scholarship Fall ’12
Department of Geology and Geophysics Scholarship Fall ’12
Nominated for Outstanding Senior Award Spring ’16

NOVA GEOPHYSICAL SERVICES

JEFFREY HEENAN

Summary

Field geophysicist Senior with laboratory experience well versed in electrical geophysical methods,

including advanced modeling techniques, and ground penetrating radar.

Areas of Expertise

Electrical Geophysics

- Extensive use of electrical geophysical methods (resistivity, self potential, and induced polarization) for hydrological and remediation projects in the field and laboratory.
- Designed and constructed survey systems for long-term, autonomous surveys in remote areas.

Ground Penetrating Radar (GPR)

- Experience using GPR in environmental survey as well as in engineering surveys (locating underground storage tanks, utilities, etc.)

General Geophysics

- Extensive experience troubleshooting, repairing, and conducting general maintenance on geophysical equipment in the field, including in remote areas.

Experience

Graduate Research Assistant **01/2010 to 07/2011**
Rutgers - Newark **Newark, NJ**
Designed and conducted geophysical experiments in both the laboratory and in the field.

Student Contractor **07/2011 to 07/2013**
Environmental Protection Agency **Newark, NJ**
Designed and conducted geophysical experiments in both the laboratory and in the field.

Geophysicist **06/2014**
NOVA Geophysical Services **Douglaston, NY**
Performed electromagnetic and magnetic geophysical surveys with a focus on engineering projects.

Education

Bachelor of Science: **Geology** **2009**
SUNY Oswego Oswego, NY

Ph.D.: **Environmental Science** **2015**
Rutgers - Newark Rutgers, NJ

Affiliations

Society Of Exploration Geophysics, Society Of Exploration Geophysics: Near Surface Geophysics Section, Society Of Exploration Geophysics Student Chapter (Rutgers - Newark)

NOVA GEOPHYSICAL SERVICES

Christine M. Kimak

EDUCATION

Master of Science, Environmental Science (October 2015)
Rutgers, The State University of New Jersey, Newark, NJ
Thesis: "Non-Invasive Monitoring of Microbial Induced Oil Degradation in Beach Sediment Under High Conductivity Conditions Using the Spectral Induced Polarization Method"

Bachelor of Science, Marine and Environmental Science (May 2003)
United States Coast Guard Academy, New London, CT

PROFESSIONAL EXPERIENCE

U.S. Coast Guard Sector New York, Staten Island, NY November 2012-March 2013
Type 1 ICS Liaison Officer
Supported the Hurricane Sandy Pollution Response Unified Command led by the Coast Guard, EPA, State of NY, and State of NJ. Strong grasp of and firm commitment to environmental, safety, and security policies. Overall this response included Major Oil Spills, dozens of medium spills and thousands hazmat and oil spill threats from sunken boats, drums and cylinders. Participated in incident investigations (including three facility oil spills) and coordinated spill removal activities with contractors. Responsible for auditing, reconciling, and recording contractor invoice and hazardous waste manifests against field reports/contracts to ensure proper charges. Accurately captured all costs associated with three Disaster Project Numbers for final payment and cost recovery.

Cintas Fire Protection, Ledgewood, NJ December 2011-May 2013
Project Manager
Oversaw the Sprinkler Department, including nine technicians, one customer service representative, and one fire sales engineer. Responsibilities included managing the day to day operations of the department, liaising with customers to resolve discrepancies, overseeing large install/repair projects, invoicing all service, monitoring subcontract work, and leading weekly team meetings. Additionally, coordinated and provided training on various safety topics and compliance to broad audience that included management, sales staff, office partners, and field technicians.

- Sales (Product Line) vs. Projections: $2.77 Actual vs. $2.13 Projection
- Profit (Product Line) vs. Projections: 19% Actual vs. 17.2% Projection
- Net vs. Projections: 404K vs. 134K Projection
- Project Manager for $168K install project at a production plant in Piscataway, NJ
- Project Manager for $80K install project at a group home in Trenton, NJ

U.S. Coast Guard Sector New York, Staten Island, NY July 2008-September 2011
Assistant Chief, Port Security/Contingency Planning
Developed, trained, exercised, and evaluated comprehensive, multi-mission contingency plans for the nation's third largest port. Oversaw the CG's involvement in the Area Committee (composed of experienced environmental/response representatives from federal, state and local government agencies with definitive responsibilities for the area's environmental integrity). Worked extensively with the National Park Service, EPA, NJ State Police, NJ Dept. of Environmental Protection, NY Dept. of Environmental Conservation, Port Authority of NY/NJ, NYPD, FDNY, NYC Office of Emergency Management, petroleum facility operators, and local Oil Spill Removal Organizations. Supervised seven personnel and was responsible for a $50K annual budget.

U.S. Coast Guard Intelligence Coordination Center, Washington, DC July 2005-July 2008
Intelligence Watch Officer
Regularly prepared recommendations via formal reports for CG senior leadership after careful research and analysis from various Intelligence Community reports. Provided real-time situational awareness of the global intelligence picture to the Commandant (COMDT) of the Coast Guard and his senior staff, and coordinated the sharing of maritime intelligence between the CG and 15 other intelligence organizations to facilitate interagency responses to maritime threats. Prepared and delivered daily intelligence briefs to the COMDT and tracked current threat streams and Intelligence Community reports in order to provide situational and strategic awareness to CG senior leadership supporting operations and policy decisions.

NOVA GEOPHYSICAL SERVICES

PETER HURST

EMPLOYMENT

NOVA GEOPHYSICAL SERVICES November 2018- Present

- Performs Geophysical Engineering Surveys
- Provides site oversight during the SUE surveys
- Experience in testing water level in local aquifers
- Experience in using Trimble GeoExplorer 6000 cm Edition to measure elevation and collect GPS coordinates

FIELD/LAB EXPERIENCE

The College of Wooster Fall 2015-Spring 2018

- Experience in low-flow ground water sampling from monitoring wells using interface probe
- Educated in generating soil boring logs and soil characterization
- Experience in testing water level in local aquifers
- Knowledge in data management including database entry and ArcGIS compatibility
- Experience in using Trimble GeoExplorer 6000 cm Edition to measure elevation and collect GPS coordinates

RESEARCH EXPERIENCE

Senior Independent Study Thesis, The College of Wooster Spring 2017-2018

"*An Analysis of Caddisfly Cases from Bioherms in the Upper Green River Formation, White Hill Cuesta, Ephraim, Utah*"

- Tested rock samples using XRD, XRF, magnetic susceptibility, acetate peels, and thin section analysis
- Coordinated field site investigation and data collection in Ephraim, Utah
- Generated digital maps and stratigraphic columns of field site using ArcGIS and Adobe Illustrator
- 1 of 5 undergraduate students invited to orally defend thesis at the American Association of Petroleum Geologists - Annual Convention & Exhibition 2018

LEADERSHIP EXPERIENCE

The College of Wooster

President of Geology Club Spring 2017-2018

- Coordinated funding for 2017 GSA Annual Scientific Meeting

Teaching Apprentice (Invertebrate Paleontology) Fall 2016

- Held weekly office hours to aid students with developing research papers and test preparation

EDUCATION

The College of Wooster, Wooster, OH **Graduation:** May 2018

Degree: Bachelor of Arts. **Major:** Geology **Honors:** Dean's List

Relevant Coursework: Petrology, Mineralogy, GIS, Climate Change, Structural Geology, Geomorphology & Hydrogeology, Sedimentology & Stratigraphy, Physics

TECHNICAL & INTERPERSONAL SKILLS

Proficient in Microsoft Suite
Experienced in Adobe Illustrator and ArcGIS; Exposure to AutoCAD
Knowledge of Phase I Environmental Site Assessment principles and familiarity with ASTM Standard E1527-13
Great understanding of field sampling techniques
Background in contractor oversight
In-depth knowledge of construction process from material selection, techniques, equipment, cost control, and safety
Background in residential and commercial construction and remodeling
Exceptional verbal/written communication and organizational skills
Efficient learner and ability to master new skills quickly

NOVA
GEOPHYSICAL
ENGINEERING
Subsurface Mapping Solutions
56-01 Marathon Parkway # 765
Douglaston, New York 11362
347-556-7787 (PHONE)
718-261-1527(FAX)
www.nova-gsi.com

Jason Staunton

Education:

Bachelor of Science, Kutztown University, Kutztown, PA
Major: *Geology* June 2024

Employment:

Geophysicist /Environmental Consultant – Nova Geophysical Services June 2024 - Present

- Perform Geophysical Surveys including GPR, EM, ERT, Resistivity and Seismic
- Responsible to interpret Ground Penetrating Radar (GPR), Electromagnetic (EM) data.
- Report and mark anomalies for collaborating companies to identify for borehole drilling and soil sampling.
- Responsible to keep detailed reports of daily work and site locations.

Research Assistant - Kutztown University, Newark NJ January 2013 - Present

- Creating customized columns for MEOR (Microbial Enhanced Oil Recovery).
- Calibrating and taking measurements for columns using SIP (Spectral Induced Polarization) instrument.
- Assisted in inventing an SIP borehole tool to characterize the subsurface.
- Assisted in inventing an IRIS for SIP borehole tool to account for noise made from electrical currents.
- Creating customized ERT (Electrical Resistivity Tomography) arrays.

Experience and Expertise:

Field locations: Avondale (PA), Trenton (NJ), Tuxedo (NY), and New Orleans (LA)
Computer: Microsoft Office (Excel, Word and Power Point), QuickBooks, ArcGIS 10.0, LSIP Measuring Tool, Radic-SIPII Lab, ZoneRes 2D.
Analytical: Laser diffraction particle size analyzer, Eh (Redox Potential) meter, pH meter, Conductivity meter, Autoclave, and XL20 meter.
Field: Stratigraphic Columns, Geological Mapping, Joint Analysis, and Pocket Transit.
Geophysics: Resistivity meter, GPR (Conquest and Nogging), IRIS Syscal Proswitch, ERT, IP/SIP, and Seismic Reflection/Refraction.

NOVA GEOPHYSICAL SERVICES

Jung Yun

Education:

Bachelor of Science, Rutgers University Newark, NJ
Major: *Geology* January 2014

Employment:

Field Geologist – Nova Geophysical Services January 2014 - Present

- Responsible to interpret Ground Penetrating Radar (GPR) data.
- Report and mark anomalies for collaborating companies to identify for borehole drilling and soil sampling.
- Responsible to keep detailed reports of daily work and site locations.

Research Assistant - Rutgers University, Newark NJ January 2013 - Present

- Creating customized columns for MEOR (Microbial Enhanced Oil Recovery).
- Calibrating and taking measurements for columns using SIP (Spectral Induced Polarization) instrument.
- Assisted in inventing an SIP borehole tool to characterize the subsurface.
- Assisted in inventing an IRIS for SIP borehole tool to account for noise made from electrical currents.
- Creating customized ERT (Electrical Resistivity Tomography) arrays.

Physical Therapist Assistant – Edison Rehab and Wellness October 2011 – January 2013

- Responsible for patients' treatment.
- Bookkeeping – To give quarterly updates of net profit/loss of the company.
- Administrative duties (Bill pay, supplies management, etc.)
- Responsible to keep detailed medical records of patients.

Manager – Sun's Fish Market January 2005 – September 2011

- Developed advertising strategies to increase traffic and customer loyalty.
- Resolved problems with staff and customers quickly and equitably.
- Managed customer's orders (take orders, cook, and service).
- Supplies management.

Experience and Expertise:

Field locations: Avondale (PA), Trenton (NJ), Tuxedo (NY), New Orleans (LA)
Computer: Microsoft Office (Excel, Word and Power Point), QuickBooks, ArcGIS 10.0, LSIP Measuring Tool, Radic-SIPII Lab, ZoneRes 2D.
Analytical: Laser diffraction particle size analyzer, Eh (Redox Potential) meter, pH meter, Conductivity meter, Autoclave, and XL20 meter.
Field: Stratigraphic Columns, Geological Mapping, Joint Analysis, and Pocket Transit.
Geophysics: Resistivity meter, GPR (Conquest and Nogging), IRIS Syscal Proswitch, ERT, Heliflux Magnetic Locator, IP/SIP, and Seismic Reflection/Refraction.

INSURANCE QUALIFICATION

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 05/06/2025

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	Prof. Risk Planners, Inc. 1373-20 Veterans Mem. Hwy Hauppauge NY 11788	**CONTACT NAME:**	
		PHONE (A/C, No, Ext): (631) 360-8800	**FAX (A/C, No):** (631) 360-8875
		E-MAIL ADDRESS:	
		INSURER(S) AFFORDING COVERAGE	**NAIC #**
		INSURER A : Berkley Insurance Company	
INSURED	Lece Corporation Nova Geophysical Services 56-01 Marathon Parkway PO Box 765 Douglaston NY 11362	**INSURER B :** Standard Security Life	69078
		INSURER C : Transportation Insurance	
		INSURER D :	
		INSURER E :	
		INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	**GENERAL LIABILITY** X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR X Professional/ Poll GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY PRO-JECT LOC			FEI-ECC-18390-01	11/13/2024	11/13/2025	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 3,000,000 $ 50,000 $ 5,000 $ 3,000,000 $ 3,000,000 $ 3,000,000
A	**AUTOMOBILE LIABILITY** ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS			FEI-ECC-18390-01	11/13/2024	11/13/2025	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
	UMBRELLA LIAB OCCUR **EXCESS LIAB** CLAIMS-MADE DED RETENTION $						EACH OCCURRENCE AGGREGATE	$ 5,000,000 $
C	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY** ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? **(Mandatory in NH)** Y / N: N If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		WC 5 85634886	11/25/2024	11/25/2025	X WC STATU-TORY LIMITS OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 1,000,000 $ 1,000,000 $ 1,000,000
B	NYS Disability			R97368-000	01/01/2025	Until Cancelle	Statutory Limits	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Re: Geophysical Engineering Surveys

Additional Insured:

AI 028293

CERTIFICATE HOLDER

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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APPENDIX G - FIELD FORMS

GEOPROBE LOG

GEOPROBE NUMBER:

SHEET NUMBER: 1 of _____

PROJECT NUMBER: 22254

PROJECT:
LOCATION:
CLIENT:
CONTRACTOR:

DRILLER:
INSPECTOR:

DRILLING METHOD: Push Sampling
RIG TYPE: Geoprobe ( )

LOCATION:
COORD.: N: E:
STN. NO.: OFFSET:
SURFACE ELEV.:
DATUM:

START DATE: TIME:
FINISH DATE: TIME:

	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel
Type/Symbol		S ■	U ▯	P ▨	G ▩	C ▤
I.D. (inches)						
O.D. (inches)						
Length						
			Sleeve size			
			I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min/.ft)	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	SAMPLE DEPTH (feet)	REC (in.)	FIELD CLASSIFICATION AND REMARKS
2								
4								
6								
8								
10								

Boring No. _____ Sheet 1 of _____

GEOPROBE LOG

BORING NUMBER:

SHEET NUMBER:_____ of _____

PROJECT NUMBER:

PROJECT:

LOCATION:

CLIENT: Dattner Architects

CONTRACTOR:

DRILLER:

INSPECTOR:

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min/.ft)	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	SAMPLE DEPTH (feet)	SOIL (Blows/6 in.) 0/6	6/12	12/18	18/24	REC. (in.)	CORING RUN (in.)	CORING REC. (in.)	CORING REC. %	CORING L>4" (in.)	CORING RQD %	FIELD CLASSIFICATION AND REMARKS Depth Elev.

Boring No._____ Sheet____ of ____

YU & Associates
611 River Drive, Elmwood Park, NJ 07407 ● Tel: 201-791-0075 ● Fax: 201-791-4533

OBSERVATION WELL INSTALLATION LOG

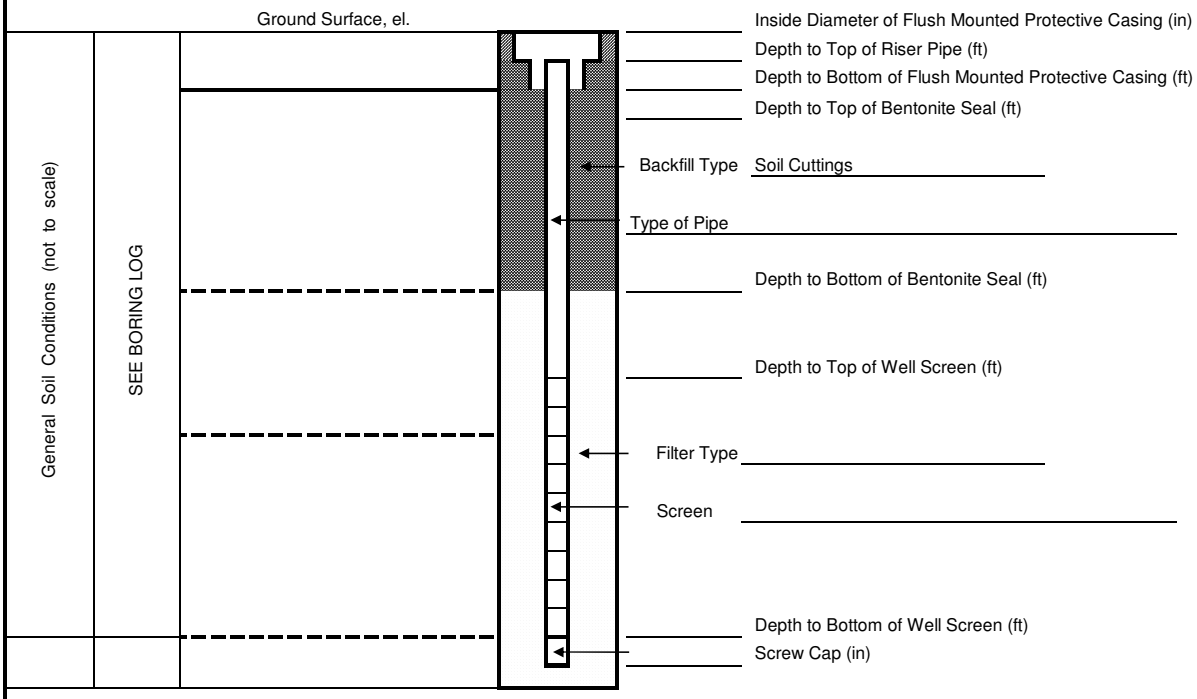
PROJECT:
LOCATION:

WELL NO.

Well No. _____
Installation Date: _____
Boring Company _____ **Inspector:** _____
Foreman: _____ **Project #:** _____

Groundwater Readings in Well *(measured in feet below ground surface)*

Date	Time	Reading(ft)	Remarks



Notes:

Well Development Information:

Time Start: _____ Date: _____
Time End: _____ Date: _____
Inspector: _____

YU & Associates, Inc.
Geotechnical, Environmental and Civil Engineering

WELL MONITORING & GAUGING FORM

Project: _____ Sampled by: _____

Location and Site Code: _____

Date: _____ Weather: _____

FIELD MEASUREMENTS:

Well ID	Time	Product Level (ft BTOC)	DTW (ft BTOC)	Total Well Depth (ft BTOC)

Well ID	Time	Product Level (ft BTOC)	DTW (ft BTOC)	Total Well Depth (ft BTOC)

YU & Associates, Inc.
Geotechnical, Environmental and Civil Engineering

WELL PURGING & SAMPLING FORM

Project: _____ Sampled by: _____

Location and Site Code: _____

Well No.: _____ Well Diameter: _____

Date: _____ Weather: _____

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

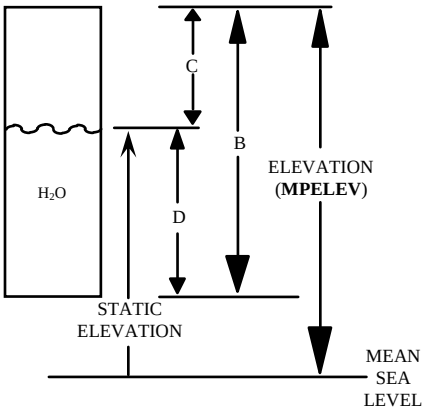
Measured Well Depth (B) (**TOTDEPTH**) _____ft.

Measured Water Level Depth (C) (**STATDEP**)_____ft.

Length of Static Water Column (D) = _____ - _____ = _____ ft.
(B) (C) (D)

Casing Water Volume (E) = _____ x _____ = _____ gal
(A) (D)

Minimum Purge Volume = _____ gal (3 well volumes)



Purge Date and Method: _____

Physical Appearance/Comments: _____

FIELD MEASUREMENTS:

Allowable Range: ± 0.1 ± 5% ±1°C

Time	Volume Removed (gal)	pH	EC (mS/cm)	Temp. (F or C)	Turbidity (NTU)	D.O. (mg/L)	ORP (mV)

Sample Time: _____ Sample ID: _____

Note: Attempt to get at least 5 sets of field measurements during purging. Sample may be collected after 3 to 5 well volumes have been removed and parameters have stabilized. Sample may be collected after 6 well volumes if parameters do not stabilize. VOC and gas sensitive (e.g. alkalinity, Fe^{2+}, CH_4, H_2S) parameters should be sampled first.