Sunoco Pipeline LP

Recovery Well Installation Work Plan

Glenwood Drive, Washington Crossing, PA 18977

Upper Makefield Township

Bucks County, PA

April 22, 2025

May 6, 2025 – rev 1

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Acronyms and Abbreviations

bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, Total Xylenes
DEP	Pennsylvania Department of Environmental Protection
DOT	Pennsylvania Department of Transportation
EDB	1,2-Dibromoethane
EDC	1,2-Dichloroethane
GES	Groundwater & Environmental Services, Inc.
HASP	Health and Safety Plan
IDW	Investigation-Derived Waste
LNAPL	Light Non-Aqueous Phase Liquid
MTBE	Methyl tert-butyl ether
NAD	North American Datum
NAVD	North American Vertical Datum
NRCS	Natural Resources Conservation Service
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
SPLP	Sunoco Pipeline LP
TOC	Top-of-Casing
TMB	Trimethylbenzene
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1 General

Groundwater & Environmental Services, Inc. (GES), on behalf of Sunoco Pipeline LP (SPLP), has prepared this *Recovery Well Installation Work Plan for Glenwood Drive, Washington Crossing, PA 18977* for the SPLP Site located at the Intersection of Glenwood Drive and Walker Road, Upper Makefield Township, Bucks County, Pennsylvania. The objective of this Work Plan is to install three (3) recovery wells (RW-2, RW-3, RW-4) in the township easement of Glenwood Drive, Washington Crossing, PA 18977 as further described herein.

All activities will be performed in accordance with GES Standard Operating and Health and Safety Procedures. Proposed activities outlined in this plan will be conducted between the hours of 9:00 am and 5:00 pm, Monday through Saturday. The tasks of this investigation are detailed below. A Pennsylvania-licensed and GES-approved driller will be contracted to perform the work on-site. All work will be performed by qualified GES staff and will be approved by a Pennsylvania-licensed Professional Geologist.

The following is a description of the proposed scope of work.

1.1 Site Overview

The Site is situated in a rural residential area in Upper Makefield Township, Bucks County, Pennsylvania at geographic coordinates 40.27033, -74.87508. In January 2025, SPLP identified a release of petroleum hydrocarbons (jet fuel) from a 14-inch diameter pipeline, which was subsequently exposed for repairs. During the initial rapid response, light non-aqueous phase liquid (LNAPL) from the release was detected on groundwater and Site investigation and remediation efforts were initiated.

1.2 Site Geology

The Site area is underlain by the Lockatong Formation (Trl), which is a Triassic-age, dark-gray to black argillite (a fine-grained sedimentary to weakly metamorphosed rock composed of indurated clay particles cemented by silica with no cleavage), having some zones of black shale and, locally, thin layers of impure calcareous shale, with a maximum reported thickness of approximately 3,800 feet. The reference section is along the Delaware River between Point Pleasant and Lumberville, Bucks County, Pennsylvania, approximately 15 miles northwest of the Site area. Bedding in the Lockatong is moderately well-developed and flaggy and thick. Joints have a blocky pattern, and are moderately developed, closely spaced, steeply dipping, and open. It is moderately resistant to weathering and is moderately weathered to a shallow depth, with small elongate and triangular fragments resulting from rapid hydration of minerals in exposed rock, with a moderately thick overlying mantle (Geyer and Wilshusen, 1982). There are no fractures or faults mapped in the immediate Site area; there are two synclines (valley-shaped bedrock structures) mapped 5-6 miles to the west of the area.

The local area is mapped as representative of good surface drainage, with joint openings providing a secondary porosity; both weathered and unweathered rock matrices have a low

primary porosity and low permeability; instead, water resides and moves along bedrock fractures. The average groundwater yield is 35 gallons per minute, with lithology being an important factor in well yield (Geyer and Wilshusen, 1982).

According to the September 26, 2023, United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil survey report, the Site area lies within the Uxb Urban land (65%) - Penn (25%) - other (10%) soil complex. This complex is described as having 0-8% slope, elevation of 200-1000 feet, and mean annual precipitation of 36-55 inches. The depth to bedrock is 10 to 100 inches, and the available water supply in the upper 0-60 inches is described as low to very low. The soil is derived from a parent material ranging from artificially covered areas to residuum weathered from shale and siltstone, is well-drained with very low runoff, and has a depth to water table of more than 80 inches.

An electrical resistivity imaging (ERI) survey was conducted from February 20 through March 7, 2025 by Rettew. Based upon the information presented in the March 25, 2025 Electrical Resistivity Imaging Report and the apparent and inferred fracture trace lines, locations for the proposed recovery wells (Figure 1) are plotted near the ERI features.

2 Recovery Well Installation

2.1 Findings: Borehole Geophysics, Routine Gauging, and Electrical Resistivity

A downhole geophysical survey was completed in the potable well at 121 Glenwood Drive on February 10, 2025. The potable well is located approximately 240 feet southwest of the nearest proposed recovery well location and 320 feet southwest of the farthest proposed recovery well location (**Figure 1**). The following are notable features identified from the borehole geophysics conducted on the potable well at 121 Glenwood Drive:

- The total depth of the well was measured at approximately 141.0 feet below “top of casing” (TOC).
- The depth to water was measured at 28.9 feet below TOC at the beginning of the survey.
- The diameter of the casing at the surface was measured to be nominally 6 inches, and the bottom of the casing was located at approximately 29.8 feet below TOC.
- The caliper log showed notable enlargements due to fracturing centered near 32.0, 45.5, 67.5, 79.0, and 131.5 feet below TOC.

The Rettew Borehole Geophysics report is provided as **Attachment 3**. Well gauging at the potable well is conducted on a near daily frequency. The depth to water measured in the potable well ranges from 24.44 feet to 34.12 feet below TOC.

The findings provided above support installing the recovery wells to a maximum targeted depth of approximately 70 feet bgs at the locations shown on **Figure 1**. Based on the findings during borehole advancement, the depth of the well may be modified in the field. The final well depth will

be based on geologic observations and drilling conditions relative to depth of fractured zones and water producing zones.

2.2 Pre-Drilling Protocol

The Pennsylvania One-Call Public Utility mark-out service (PA One-Call) will be contacted prior to performing any subsurface investigative activities at the Site to renew the mark-out of public utilities initially conducted in April 2025. The PA One-Call service identifies the locations of the subsurface public utilities (electric, natural gas, water, telephone, etc.), but not the private utilities for which they are not responsible. A private subsurface utility survey was conducted on Glenwood Drive by Stantec on April 8-9, 2025. The locations of the private utilities and proposed recovery wells are depicted on **Figure 1**.

A 2-foot by 2-foot opening will be saw cut in the asphalt road surface at each borehole location. Each borehole will be hand-cleared via vacuum excavation or other hand tools to a minimum depth of five feet below ground surface (bgs) or refusal to ensure the borehole is clear of potential unidentified utilities or other subsurface features. The borehole shall be cleared a minimum of two inches in diameter larger than the drill bit to be used to allow for visual inspection of potential obstructions. Soil will be routinely screened with a photoionization detector (PID) during utility clearing activities and the GES scientist will characterize the soil according to the Unified Soil Classification System (USCS) by recording the color, composition, and moisture content on a drilling log. The GES Standard Operating Procedure (SOP) for subsurface clearance protocol is included in **Attachment 1**.

2.3 Soil Sampling

Up to two soil samples from each borehole may be collected for submittal for laboratory analysis using low-level methanol sampling test kits to document soil quality at the boring location. At a minimum, one soil sample will be collected from the soil/bedrock interface or from the soil/groundwater interface, whichever is first encountered. One additional soil sample will be collected from the soil column at the interval eliciting the highest PID response (i.e., anything greater than 20 parts per million-volume). The GES SOPs for soil sampling and soil screening are included in **Attachment 1**.

The soil samples will be transported under proper chain-of-custody documentation to Pace Laboratories. Soil samples will be analyzed for the PA Department of Environmental Protection (DEP) Leaded / Unleaded gasoline / Aviation Fuel parameters benzene, toluene, ethylbenzene, and total xylenes (BTEX), methyl tert-butyl ether (MTBE), isopropylbenzene, naphthalene, 1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, 1,2-dichloroethane (EDC), and ,2-dibromoethane (EDB) via United States Environmental Protection Agency (USEPA) Method 8260D, and total lead USEPA Method 6010. The laboratory accreditation is provided as **Attachment 2**.

2.4 Well Installation

A well permit application has been approved by Bucks County Department of Health (**Attachment 4**). The well permit from Upper Makefield Township is pending. The general recovery well installation scope of work is summarized as follows:

- The drilling technique will be air rotary.

- A nominal 8-inch diameter borehole will be drilled to a depth of approximately 10-15 feet bgs (at least 2 feet into competent bedrock) using air rotary drilling technology A permanent 6-inch diameter steel casing will be installed and set in a concrete grout to preclude surface water from entering the well.
- During drilling activities, the GES scientist will characterize the soil according to the USCS by recording the color, composition, moisture content, and lithology on a drilling log. The rock cuttings will also be characterized in the same nature.
- Soil/drill cuttings will be screened with a PID at five (5) foot intervals to determine the relative presence or absence of volatile organic compounds (VOCs) and visual observations for the presence or absence of petroleum product / sheen. Groundwater produced during the drilling will also be observed for the for the presence or absence of petroleum product / sheen.
- A containment area will be set up at each borehole to contain drilling fluids prior to the start of the drilling. A vacuum truck will be on-site during all drilling to remove any and all drilling fluids during the work. In the event that petroleum product is encountered during the drilling, the vacuum truck will be capable of extraction and off-site disposal.
- RW-2, RW-3, and RW-4 will be finished as flush mount wells with a 12-inch diameter, traffic-rated steel, bolt-down cover. The PVC casing inside the traffic box will also be fitted with a water-tight locking gripper plug to prevent incursion of surface water into the well.
- A 2-foot by 2-foot concrete pad will be constructed around the flush mount well covers at each recovery well location, and will be sloped to match the asphalt surface grade to allow for runoff of surface water and preserve the integrity of the concrete and surrounding asphalt.
- Water from an approved source will be utilized during drilling, if necessary. The source of the water is from the private water well from the well driller's facility. It is not anticipated that a significant volume of water will be required, but it may be necessary to prevent dust generation. The laboratory analytical results are included as **Attachment 5**.
- Upon completion, the driller will submit the drilling records to the Pennsylvania Department of Conservation and Natural Resources. Additionally, a detailed drilling log will be prepared by GES which will be reviewed by a Pennsylvania licensed Professional Geologist that is supervising the work.

GES SOPs for well drilling and well development are included in **Attachment 1**. A schematic of the recovery well construction is included in **Attachment 6**.

2.5 Domestic Supply Well Monitoring

Per discussions between PADEP and SPLP on April 21, 2025, nearby domestic supply wells located on Glenwood Drive and Walker Road will be monitored during the drilling activities outlined in this plan, if landowner consent and access is provided. Liquid level data and PID readings will be recorded for each domestic well monitored. An interface probe and a PID will be used to record liquid level data and wellhead screening multiple times from various domestic well locations on Glenwood Drive and Walker Road. In addition, water may be collected from various domestic well locations on Glenwood Drive and Walker Road on a routine basis with a bailer for

visual inspection if the PID wellhead screening is greater than 1.0 parts per million (ppm). However, it should be noted that due to spacers and/ or wire guards existing in certain domestic wells, a bailer may not be deployed for visual inspection. Additionally, during drilling, a potable well at a property on Glenwood Drive will be gauged with an interface probe every 2-4 hours, if landowner consent and access is provided. Data obtained from domestic well monitoring will be documented accordingly. SOPs for water level gauging and visual inspections are in **Attachment 1**. This method of monitoring will provide for real time data and if there is adverse influence observed, immediate changes during the drilling operations can be made (i.e., reduce air flow or stop work is needed).

Lastly, transducers will be deployed in a former domestic supply well on Spencer Road and in RW-1 (also located on Spencer Road) during drilling activities outlined in this plan.

2.6 Air and Noise Monitoring

Outdoor air monitoring and sampling and noise monitoring will be implemented at properties in the Mt. Eyre Manor neighborhood during the drilling activities outlined in this plan. Air monitoring and sampling and noise monitoring will generally occur along the perimeter of the Properties, primarily between the area where recovery well installation activities will occur (the work area) and nearby residences. The objectives and scope are more fully detailed in the Air and Noise Monitoring Plan for Recovery Well Installation included in **Attachment 7**.

2.7 Surveying

The elevation and location of the newly installed recovery well will initially be recorded using a Trimble GPS unit. Following the well installation activities, a professional surveyor licensed in the Commonwealth of Pennsylvania will collect the horizontal datum utilizing the Pennsylvania State Plane Coordinates, North American Datum (NAD) 83, South Zone recorded to the nearest 0.1 foot and the vertical ground surface and top-of-casing (TOC) elevations utilizing North American Vertical Datum (NAVD) 88 recorded to the nearest 0.01 foot.

2.8 Well Development Procedures

The newly installed recovery wells will be properly developed based upon the groundwater conditions encountered, typically 24 hours after the surface pad and outer protective casing are installed. RW-2, RW-3, and RW-4 will be developed by the drilling contractor during installation to remove the residual materials remaining in the well after installation has been completed, and to try to re-establish the natural hydraulic flow conditions which may have been disturbed by well construction, around the immediate vicinity of the well. Liquids produced during well development will be managed as noted in Section 2.8. The SOP for well development is in **Attachment 1**.

2.9 Investigation-Derived Waste Management

Construction debris, soil, and drill-cuttings generated during well installation activities will be containerized in Pennsylvania Department of Transportation (DOT)-approved, steel 55-gallon drums for disposal in accordance with the Waste Management Plan dated February 26, 2025. A

vacuum truck will be on-Site to assist with the removal of groundwater and / or petroleum product from the containment area. The vacuum truck will take the waste off-site to a designated facility at the completion of the well installation. All available laboratory analytical data will be provided to prepare the waste profile for the vacuum truck, which will be signed as Generator Knowledge. All waste generated during well installation activities will be transported off-Site for disposal at a PADEP permitted waste facility as outlined in Waste Management Plan (**Attachment 8**).

2.10 Health, Safety, and Security

All field activities will be conducted in accordance with the site-specific Health and Safety Plan (HASP) prepared by GES for this site (**Attachment 9**). GES personnel engaged in on-Site activities will have the training necessary to perform each of the prescribed tasks. Familiarity with the guidance documents and standards listed below is required prior to engaging in on-Site activities:

- Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (OSHA 29CFR1910.120)
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985) (NIOSH/OSHA/USCG/EPA)
- Health and Safety Requirements for Employees Engaged in Field Activities (EPA Order 1440.2)

Safety measures will be implemented to manage traffic and pedestrian flow during well installation activities, including contracting a traffic control flagger team. Road opening permits will be obtained prior to commencement of the well installations. Clear and safe routes of personnel ingress and egress will be established by work zone separation, visibility, signage, barriers (including sound barriers), training, and communication. A Traffic Plan dated April 11, 2025 is included as **Attachment 10**.

A clearly demarcated work zone will be utilized to restrict unauthorized access. The only personnel that should be in the immediate work zone near the drill rig are the drilling company and GES support personnel. Warning signs that indicate potential hazards and safety protocols, as well as emergency contact information, will be posted at prominent locations at the work zone. All other personnel near the work zone must remain at least 10 feet away from the immediate work area in the event that person does not have the proper training certifications or personal protective equipment (i.e., steel toe boots, hearing protection, etc.). Crossing into the immediate work area is considered a breach of security.

Daily health, safety, and security meetings will be conducted to review training, standard operating procedures, job hazard analysis, work scopes, and hazard communication. The equipment will remain staged at the borehole until drilling is complete. All equipment within the work zone will be secured overnight to prevent theft or unauthorized use. The vacuum truck will depart site each day.

2.11 Monitoring, Geophysical Survey, and Recovery

After the wells have been developed, the following activities will be conducted (with a scope and schedule to be developed upon completion of well installation):

- Routine gauging using an oil-water interface probe. The frequency and scope of gauging is to be determined if there is LNAPL present;
- Borehole geophysical logging (including the UV light sonde and other borehole logging tools as presented in Attachment 3).
- If LNAPL is encountered, the recoverability and recovery options will be evaluated.
- Upon completion of the well installation and evaluation of site data; other investigative methods, such as packer testing, may be conducted.

3 References

Geyer, A.R., and J.P. Wilshusen. 1982. *Engineering Characteristics of the Rocks of Pennsylvania, Second Edition*, Pennsylvania Geologic Survey, Harrisburg, PA.

United States Department of Agriculture, Natural Resources Conservation Service. September 26, 2023. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Figure

Stantec

Legend

Approximate Utility Locations
- Communications
- Electric
- Underground Piping

Proposed Recovery Well Locations

N

0 20 40 60 Feet
(At original document size of 11x17)
1 in = 60 feet

Notes

1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
2. Data Sources: Stantec
3. Background: USGS Topo Layers (TMN): USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State HIU; NOAA National Centers for Environmental Information. Data refreshed February, 2025.
Nearmap WMS Server:

Project Location
Upper Makefield Township,
Bucks County, PA

Prepared by GWC on 2025-04-10
TR Review by XXX on 2025-xx-xx
IR Review by XXX on 2025-xx-xx

Client/Project 195603566
Energy Transfer Marketing & Terminals L.P.
ET Washington Crossing

Figure No.
1

Title
Subsurface Utility Survey Map and Proposed Recovery Well Locations

\\us0245-prfss01\shared_projects\195603566\03_data\gis_cad\gis\PRO\utilities map.aprx Revised: 2025-04-10 By: GCurry

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Attachment 1

Standard Operating Procedure

SOP #:	FM-1.2 Rev. 002
Review Date:	4/20/2023
Origin Date:	03/01/2016

Title: Subsurface Clearance Protocol

1. Purpose/Scope

The purpose of this standard operating procedure (SOP) is to prevent injury to workers and damage to subsurface structures (including tanks, pipe lines, water lines, gas lines, electrical service, etc.) during ground disturbance activities such as drilling, augering, sampling, use of direct-push technologies, excavation, trenching, concrete coring or removal, fence post installation, grading or other similar operations.

This protocol provides minimum guidance for subsurface clearance activities, which must be followed prior to and during ground disturbance activities at any and all GES project sites. However, even after completing the subsurface clearance activities required in this protocol, all ground disturbance activities should proceed with due caution.

Deviations from this protocol may be provided on an exception basis for specific situations, such as underground storage tank (UST) system removals, verified overhead services, undeveloped land, idle facilities, shallow ground water conditions, soil stability, well construction QA/QC concerns, etc. GES personnel must gain approval from the Regional Health and Safety Officer (RHSO) or the Vice President of HSSE before proceeding. In these instances, the review must be documented in the case file.

This protocol shall not override any site-specific client or site supervisor procedures that are more stringent or provide a greater degree of safety or protection of health or the environment.

This SOP shall be used in conjunction with an approved Health and Safety Plan (HASP). Consult the HASP for information on the selection and use of personal protective equipment (PPE).

2. Responsibilities

2.1 Project Manager (PM)

The responsibility of the Project Manager (PM) is to ensure that all activities performed by site personnel are completed safely, in compliance with all pertinent regulations and procedures, and with the necessary equipment and resources to accomplish the tasks described in the work plan and/or field work directive (FWD). The PM will also ensure that all individuals working on GES projects are adequately trained and supervised.

2.2 Regional Health and Safety Officer (RHSO)

The Regional Health and Safety Officer (RHSO), in consultation with the Vice President of HSSE and project representatives, will designate the appropriate level of PPE for field personnel to

safely complete their work. The RHSO will also ensure this subsurface protocol has been reviewed and is understood by all site personnel involved.

2.3 Site Supervisor

The site supervisor is responsible for the safe completion of assigned tasks as described in the SOPs, HASP, and appropriate site-specific work plans and/or FWDs. He/she is required to document the work performed and alert the PM of any variances from procedures established in the documents referenced above.

3. General

The site supervisor must complete GES' Subsurface Clearance Checklist in conjunction with the following procedures. The checklist must be completed before initiating any ground disturbance activities. Once completed, it must be submitted to the PM and included in the project files.

3.1 Safety

A HASP must be available on-site and followed by all on-site personnel. GES' safety requirements must always be followed. All work areas shall be defined and secured with safety cones, safety tape, construction fence, and/or other barriers or signs, as appropriate.

Site work permits must be obtained as required by site procedures. Based on site conditions or classification, the use of intrinsically-safe equipment may be required. If applicable, the emergency shutoff switch, or other emergency equipment, shall be located for quick access and all workers must be familiar with its use.

4. Equipment/Materials

- Current site map
- As-built drawings
- Any other historical site information that may help locating subsurface features (see 7.2 below).

5. Preparation

Objective: To gather all relevant information about potential subsurface structures prior to the actual site visit.

5.1 Obtain Permits and Site Access

The PM is responsible for following all applicable laws, guidance and approved codes of practice; obtaining all necessary permits and utility clearances; and securing site access permission.

5.2 Obtain Historic Site Information

Obtain most recent as-built drawings and/or site plans (including UST, product and vent lines) as available.

> *Note: As-built drawings may not accurately depict the locations and depths of improvements and subsurface structures and should, therefore, not be solely relied upon.*

The site supervisor should obtain any other site information such as easements, rights-of-way (ROWs), historical plot plans, fire insurance plans, tank (dip) charts, previous site investigations, soil surveys, boring logs and aerial photographs, etc., as relevant to the planned ground disturbance activities. Where applicable, the site supervisor should also contact personnel who may have historic site knowledge.

6. Procedure

6.1 Mark-outs

Objective: To identify location of subsurface structures on surface.

The PM must ensure that a thorough subsurface structure mark-out at the site is completed to locate electrical, gas, communication, water, sewer, low voltage electric lines, product delivery pipelines and all other subsurface utilities/services.

Available public utility companies must be contacted at least three working days in advance to identify underground utilities. In addition, where available, a private utility/pipeline mark-out company should be contracted to perform an electronic subsurface survey to confirm the presence of subsurface structures.

Site supervisor should review all available subsurface information with private mark-out company to assist in line locates.

> *Note: Line location mark-outs may not accurately depict the locations of improvements and subsurface structures and should, therefore, not be solely relied upon.*

Where possible, the site supervisor is encouraged to be on-site during subsurface mark-outs. This is to ensure accuracy and understanding of subsurface structures identified, and provides an opportunity to exchange information with mark-out company personnel regarding planned work activities.

If they cannot be located by other means, water and sewer line locations/routings may be determined by alternative methods such as snakes, cameras, etc. Subsurface structures should be marked throughout the entire work area with adequate materials (e.g., site conditions may require paint and tape/flags). Ground disturbance activities must be started within 30 days of utility mark-out, unless local ordinances specify a shorter time period. If activities are not started within required time period or markings have faded, mark-outs must be redone.

The site supervisor should record time and date of mark-out request, list all companies contacted by the service, and the confirmation number. This should be available for review on-site and checked off after visual confirmation of markings.

6.2 Initial Site Visit

Objective: To compare the site plan to actual conditions based on information gathered in procedures described above, to obtain additional site information needed and to prepare a vicinity map.

The site supervisor shall document all findings and update the site plan with this information and provide updates to PM. On third party sites, close coordination with the site owner's representatives for mark-outs, review of as-builts, and other information reviews should be conducted prior to work.

The inspection should include the following activities and may include others as determined by the site supervisor and the PM:

6.2.1 Utilities

The site supervisor shall perform a detailed site walkthrough to identify all aboveground indicators of subsurface utilities/services that may be leading to or from buildings within the planned work area. The inspection shall include, but not be limited to, the following:

- Utility mark-outs
- Aboveground utilities
- Area lights/signs
- Phones
- Drains
- Junction boxes
- Natural gas meters or connections
- Other utilities including: fire hydrants, on-/below-grade electrical transformers, splice cages, sewer lines, pipeline markers, cable markers, valve box covers, clean-outs/traps, sprinkler

systems, steam lines (including insulated tanks that may indicate steam lines), cathodic protection on lines/tanks

- Observe paving scars (i.e., fresh asphalt/concrete patches, scored asphalt/concrete)

  Note: In many cases, low voltage electric lines and individual property water and sewer line branches are not marked by the utility companies. In these cases, determine an area or path where the utilities are likely located. First, locate the entry/connection location at the facility building. Next, attempt to identify utility connections for the mains (water, sewer, etc.) by locating cleanouts, valve manways, etc. The location/path of the utility is likely within the area between the main connection and the facility building connection. Also, subsurface electrical line locations from the facility building to signs, lamps, etc., can be estimated with the same process. In some instances, trench cuts are apparent on the surface/ roadways/berms, etc.

6.2.2 Product Systems

The site supervisor shall perform a detailed site walkthrough to identify all aboveground indicators of product systems within the planned work area. Speak with someone (retailer, field supervisor, person responsible for issuing permit, etc.) with historical site knowledge.

For UST systems:

- Inspect for the presence of a dispenser pan and determine piping materials and whether piping is rigid or flexible, as flexible piping runs may not be straight between connection points.
- Visually inspect the location of the tank field, observation wells, dispensers, vent stack(s), and UST fill points. Note the location of the emergency shutoff switch and become familiar with its use.
- Note the orientation, arrangement, location, size/capacity, etc., of the tanks and submerged turbine pump (STP) covers (associated with product lines) and extractor covers (associated with stage I/II vapor recovery). Determine the burial depth of the tank field to also estimate burial depth of product lines, etc.
- Observe paving scars that may indicate location of product piping or other subsurface structures.

For other sites (e.g., refineries/chemical plants, terminals, bulk plants, exploration & production facilities), inspect for the presence of underground pipelines associated with pumps and pump galleries, manifolds, tank fields, compressors, production wells, loading racks, underground valves and other process equipment types. Inspect for underground instrumentation cable runs, as well as process/storm sewers. Note location of programmable logic controllers (PLCs), remote instrumentation lines (process analyzers) leading to/from motor operated valves (MOVs), etc.

6.2.3 Existing Remediation Systems

Visually inspect the location of aboveground components. Note the locations of well covers, sparge points, etc. Observe new pavement/asphalt that may give indications of subsurface piping that is connected to recovery/injection wells and the aboveground components. Note that some injection, extraction, or sparge points may not have a surface expression, such as a well vault.

6.2.4 Other Pertinent Features

Note any other pertinent features that may be of relevance to the planned subsurface activities (e.g., underground private pipelines marked by aboveground designators, covers not associated with known lines that may be associated with historical underground tanks, hydraulic lifts, etc.).

6.3 Selection of Ground Disturbance Locations

Objective: To document, communicate and review the selected ground disturbance area locations.

6.3.1 Define 'Critical Zones'

The following minimum criteria should be applied to determine critical zones:

- 10 feet (3 meters) distance from the furthest edge of any tank, pump(s) and pump galleries, manifolds, on/below grade transformers, compressors, production wells, loading racks, and other process equipment types.
- 10 feet (3 meters) distance surrounding dispenser island canopy drip line.
- 10 feet (3 meters) distance from all suspected underground lines. Distance requirements may increase based on site conditions such as soil type, slope stability factors, and depth of subsurface ground disturbance activities to ensure that underground line integrity is maintained.
- Final critical zone determination shall be reviewed with the PM.
- For retail sites, the entire area between the tank field and dispenser islands.

Regional/site-specific modifications to the critical zone applicability can be requested by the PM/area manager through the management of change process. More restrictive measures shall supersede if required by regulation or client.

6.3.2 Select Ground Disturbance Locations

The site supervisor should utilize the information collected to this point in combination with regulatory requirements and project objectives to select ground disturbance locations. Ground disturbance locations should also consider the location of overhead obstructions such as power lines, etc. If possible, the site supervisor should avoid selecting locations within the critical zone.

6.3.3 Review Selected Locations with the PM

The site supervisor must review the selected ground disturbance locations with the PM.

Note: The site supervisor must not proceed with the subsurface activities until the plan has been discussed with the PM. If relocation of planned subsurface activities is necessary outside of previously reviewed and approved limits/areas, the site supervisor must contact the PM prior to proceeding.

6.4 Subsurface Structure Delineation Activities

Objective: To delineate to the fullest extent possible any subsurface structures prior to ground disturbance activities in order to prevent potential worker injuries, product release and/or damage to those structures.

6.4.1 Supervision

The site supervisor's on-site representative will be responsible for all ground disturbance activities and must have a copy of this protocol on-site.

All ground disturbance activities, including surface removal, will be performed, observed, or supervised by the site supervisor at all times. He/she will ensure that the work is performed with due caution and will be alert for warning signs that could indicate the presence of underground tanks, lines, or other subsurface structures. If any such indications arise, the work should immediately stop in this area and the PM shall be contacted immediately. The site supervisor may proceed with other pre-assigned work at other locations on the site.

The site supervisor is to ensure that all workers involved with subsurface ground disturbance activities have undergone appropriate training prior to working at the site. At retail sites, UST system training must also be completed.

6.4.2 Boring Sequence

If possible, the boring sequence should be planned such that the boring furthest from any suspected underground improvements is carried out first. This is done to determine the natural subsurface conditions and to allow the site supervisor to recognize fill conditions.

6.4.3 Warning Signs

The following warning signs may indicate the presence of a subsurface structure:

- Warning Tape (typically indicative of underground services)
- Pea Gravel/Sand/Non-indigenous Material (typically indicative of tanks or lines)
- Red Concrete (typically indicative of electrical duct banks)

- The abrupt absence of soil recovery in the hand auger. This could indicate pea gravel or sand that has spilled out of the auger. Except in areas where native soil conditions typically result in poor hand auger recoveries.
- Any unexpected departure from the native soil or backfill conditions as established in other on-site digging.

If any of the above warning signs or a suspicious condition is encountered, work in this area should immediately stop and the PM should be contacted.

6.4.4 Surface Removal for Paved Areas

Paving Removal

Sufficient paving or surface improvement should be removed to allow clear visibility of the subsurface conditions during clearance activities. Ground disturbance activities in an area of known subsurface structures may warrant a larger pavement opening.

- Monitoring well installations: 2 feet x 2 feet (60 cm x 60 cm) or 2-foot diameter minimum removal is suggested.
- Soil borings/push type samplers: 8 inches x 8 inches (20 cm x 20 cm) or 8-inch diameter minimum removal is suggested.

  Note: Coring and jack hammering should not take place directly over the location of known underground lines.

Surface Removal Technique

The technique used should not pose a threat to subsurface structures. Avoid use of heavy equipment if possible. In situations where heavy equipment must be used, additional precautions should be taken because subsurface structures could be located immediately below surface pavement. Final completion for holes in pavement shall be neatly saw-cut or cored unless otherwise directed by the PM.

6.4.5 Subsurface Delineation

The method used to delineate the subsurface should be compatible with the inherent associated risk given the type of facility/property, soil stratigraphy, and the location of the ground disturbance activity, such that the required delineation is obtained.

Subsurface Clearance Methods

The site supervisor should discuss clearance methods with the PM prior to start of field activities.

- Vacuum Digging: Soil should be broken up using an air knife (preferred) or water jet with subsequent vacuuming to remove loose soils. When using an air knife or water jet, the least amount of pressure possible to adequately breakup soil should be used, so as not to damage subsurface utilities.

- Probing: The probe should have a blunt or rounded tip and should be advanced by hand without excessive force.
- Hand Digging: Should be performed with a small shovel.
- Hand Augering: The auger is to be turned slowly and not forced through the soil. It is recommended that an auger without sharp points (some augers have rounded edges) be used. Note: For retail sites, probing is required prior to hand augering.
- Post-Hole Digging: A post-hole digger can be used for soil removal only and in soil that has been probed by one of the four methods noted above, and cannot be used to advance the hole depth or width.

Subsurface Clearance Procedures Based on Planned Subsurface Ground Disturbance Activities

Selected subsurface clearance methods that will achieve the highest level of precautionary investigation and/or safety based on site conditions should be reviewed with the PM prior to implementation.

1. **Drilling, Direct-Push Technologies, Augering, Fence Post Installation or Other Borehole Installation Activities:**

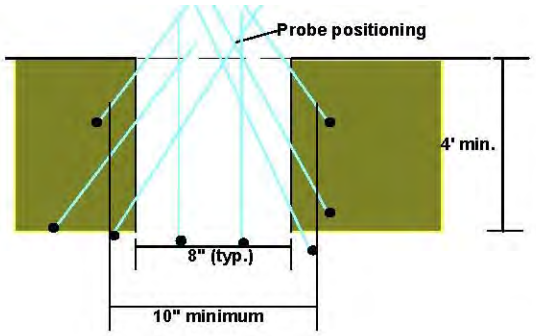
- In critical zones, a minimum delineation to a depth of 8 feet (2.5 meters) is required.
- In non-critical zones, a minimum delineation to a depth of 5 feet (1.6 meters) is required.

The first 5 feet (1.6 meters):
The area to be delineated shall exceed the diameter of the largest tool (drill auger, push type sampler, ream, or similar mechanical equipment) to be advanced and sufficiently large to allow for visual inspection of any obstructions encountered.

The first 1–2 feet (0.3–0.6 meters) can be delineated by hand digging to remove the soil.

Next, delineate the area to ensure that no obstructions exist anywhere near the potential path of the mechanical equipment by probing, augering, vacuum digging, or hand digging. Delineation shall extend as far laterally as possible and to a depth of 5 feet.

Probing Example



NOTE: Not drawn to scale.

Note: For retail sites, hand augering (or post-hole digging) can only be advanced to the depth that has been probed.

The next 3 feet (0.9 meters):
Critical Zones: For boring locations inside the critical zone, delineation is required to an additional 3 feet (0.9 meters) utilizing one of the four methods described above.

Non-critical Zones: For subsurface work outside the critical zone, delineation of an additional 3 feet (0.9 meters) may be prudent due to site conditions/climate (deep frost line), etc., but not required.

Note: For retail sites, hand augering (or post-hole digging) can only be advanced to the depth that has been probed.

2. Trenching/Excavation Activities:

- In critical zones— a minimum delineation of 5 feet (1.6 meters) for excavations of 4 feet (1.2 meters) or less, or a maximum of 8 feet (2.5 meters) for excavations exceeding 4 feet in depth. In areas where expected frost levels are greater than 4 feet, a greater delineation depth will be required.

The first 5 feet (1.6 meters) should be delineated by hand or vacuum digging to remove the soil unless an alternative delineation method has been reviewed with the PM.

- *Outside the critical zone*— site-specific conditions will determine the appropriate course of action and delineation requirements must be reviewed with the PM prior to start of ground disturbance activities.

Appropriate subsurface clearance methods should be conducted along the length and width of the excavation at a frequency sufficient to ensure adequate precautions have been applied to the entire work area. The frequency and density of investigations shall be based on site knowledge, potential hazards and risks of the site/work area, and surrounding locations (e.g., proximity to residential and public areas).

Whenever subsurface structures are exposed, work in area must cease until precautions (flags, cross-bracing, stakes, etc.) are taken to ensure that the integrity of those structures is maintained during the trenching/excavation and subsequent backfilling activities. A minimum 2-foot buffer zone must be maintained around exposed lines. No mechanical equipment may enter the buffer zone.

6.4.6 Subsurface Clearance Methods

The site supervisor must employ all means necessary to prevent damaging subsurface structures. Where natural subsurface conditions (e.g., cobbles/rocks, fill material, and/or bedrock) prevent adequate delineation utilizing methods identified above, the site supervisor must employ an alternative method of delineation following review with the PM.

6.4.7 Incident Notification

If any portion of a tank, line, utility, or other subsurface structure is encountered, and there is reason to believe that it has been damaged, the work is to cease in that area and the PM and client program manager must be notified immediately. If applicable, the emergency shutoff switch should be activated.

The PM will decide if additional uncovering by hand is required. If it is confirmed that an active UST system has been damaged, tightness tests will be performed. Under no circumstances is the area to be backfilled without notifying the PM and receiving an approval to proceed.

6.4.8 Scheduling

Since subsurface delineation may be time consuming, it may be appropriate to perform the surface removal and subsurface delineation in advance of planned subsurface ground disturbance activities. If these activities are conducted in advance, the clearance holes must be adequately covered with plates and/or backfilled. Care must be taken to prevent settlement of the material used to cover or backfill the holes. For remote, idled, or access controlled sites, clearance holes can be left open; however, hazard cones, fencing or other methods shall be used to identify the hazard.

7. Records

7.1 Field Notes

Record field notes in a standard bound survey-type field book issued for general note taking/field records and available from all GES equipment administrators. Make all field book entries black ink and make any changes/corrections with a single strikethrough line. Initial and date to indicate who made the change/correction and when it was made.

7.2 Photo Documentation

Encountered subsurface features not previously identified, should be photo documented, logged in the field notes, and maintained in the project file. Field measurements identifying its location within 3 horizontal feet shall be documented on the site map and maintained in the project files.

8. Follow-Up Activities

Clean/decontaminate all hand clearing tools as necessary and return to their proper storage location.

Standard Operating Procedure

SOP #:	FM-9.7 Rev. 003
Review Date:	4/20/2023
Origin Date:	03/01/2016

Title: Screening Soil Samples Using Headspace Analysis

1. Purpose/Scope

This standard operating procedure (SOP) describes procedures to screen soil samples using headspace analysis. Headspace analysis readings are typically collected with a photoionization detector (PID) from a resealable plastic bag after the sample has been allowed to volatilize within the bag. Headspace analysis of soil samples is to be used as a qualitative analysis and should be used as a preliminary indicator for the selection of samples to be submitted for laboratory analysis.

2. Equipment/Materials

- PID or Flame Ionization Detector (FID) with particulate filters
- Quart sized resealable plastic bags
- Nitrile gloves and other personal protective equipment (PPE) as required within the site-specific Health and Safety Plan (HASP)
- Stainless steel utensils (e.g., spatulas, spoons and self-retracting utility knives) or disposable plastic utensils (e.g., spatulas and spoons)
- Non-volatilizing ink pen (to label bags)
- Field book

3. Procedure

1. Review site-specific field work directive (FWD) to determine the number and location of samples to be analyzed using headspace analysis.
2. Calibrate PID or FID and document the calibration on the Calibration Form and in the field book.
3. Collect soil from each location to be analyzed (screened) and place into a sealed plastic bag to volatilize (half fill the plastic with soil).
4. After sealing the plastic bag, shake well to mix the soil well before screening headspace.
5. After allowing to volatilize for approximately 10 minutes, analyze headspace within resealable plastic bag using PID or FID.
6. Record the highest meter response within the field book and/or on the field forms.
7. When screening soil samples for headspace analysis, temperatures should be above 50 ºF. If temperatures are below 50 degrees Fahrenheit (ºF), the samples need to be placed into the heated vehicle to allow volatilization to occur before screening.

8. Conduct a bump test on PID or FID after approximately every 10 screenings to verify PID or FID accuracy. A bump test is conducted by filling the supplied Tedlar bag with the supplied standard calibration gas, and then noting the difference between the reading and concentration of the gas (PIDs usually use a 100 parts per million (ppm) isobutylene gas for calibration). If the measured bump test concentration is more than 10% different from the calibration standard gas concentration, then re-calibrate the meter.

4. Records

4.1 Field Notes

The field notes must document all the events, equipment used, and measurements collected during the screening activities. The field notes must be legible and concise so that the entire event can be reconstructed later for reporting purposes. Field notes should detail all specific information that would be useful to understanding the nature and location of the sample screening location including depth of soil sample screened. When collecting soil samples for screening purposes mark location on a site map, as planned locations can change depending on varying subsurface features or unforeseen findings.

Standard Operating Procedure

SOP #:	FM-9.1 Rev. 003
Review Date:	06/27/2023
Origin Date:	03/01/2016

Title: Soil Sampling for Analysis

1. Purpose/Scope

This standard operating procedure (SOP) describes procedures to obtain representative soil samples for analysis. Subsurface soil samples are usually “grab” samples, used to characterize the soil at a specific depth or depth interval (e.g., 2–4 feet). On occasion, composite samples are collected from a borehole or other locations such as stockpiled soils.

2. References

ASTM D1586/ D1586M-18e1: Standard Test Method for Standard Penetration Test (SPT) and Split Barrel Sampling of Soils, 2022.

ASTM D4220/D4220M-14: Standard Practices for Preserving and Transporting Soil Samples. 2023.

ASTM D4700-15: Standard Guide for Soil Sampling from the Vadose Zone. 2016.

ASTM D5434-12: Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock. 2021.

3. Equipment/Materials

- Stainless steel utensils (e.g., spatulas, spoons, bowl, self-retracting utility knives)
- Chain-of-custody form(s)
- Shipping cooler(s)
- Aluminum foil
- Ice
- Photoionization detector (PID) or flame ionization detector (FID)
- Glassware/sample jars/Ziplock bags/specialty sampling equipment (e.g., En core, Terra Core)
- Putty knife/trowel
- Personal protective equipment (PPE) as specified in the site-specific Health and Safety Plan (HASP)
- Labels
- Indelible black ink pen

- Field notebook
- De-ionized water or distilled water and rinse water storage containers w/brushes
- Liquinox

4. Procedure

4.1 Collection of Soil Samples for Chemical Laboratory Analysis

1. Review sampling plan to determine the number and location of samples to be collected.
2. Wear PPE as required within the site-specific HASP.
3. Ensure a sufficient number of sample kits are available to collect the required number of samples and the kits are for the required analyses.
4. Collect soil samples immediately after scanning the core run with a PID or FID.
5. When collecting soil samples, remove rocks and biologic material from the sample interval.
6. Collect soil samples as stated within the field work directive (FWD) or as approved by the Project Manager (PM) when conditions dictate a variance from the FWD.
7. Label bottleware appropriately with date, analysis, time, sample ID (depth if applicable) and sampler, as well as any other necessary information. Reference SOP's FM-13.4 and 13.5.
8. Following collection of soil samples within laboratory supplied bottleware, place into a cooler on ice and maintain at 4°C.
9. After the sample has been placed into a cooler note a detailed description of the lithology of the sample as well as any other physical or sensory features such as the presence of non-aqueous phase liquids (NAPL) and PID readings.
10. If NAPL is present, describe the following:
    - Porosity of soil
    - Visual Description of NAPL
    - Volume of Soil Pore Space Containing NAPL
        - Saturated >0.5%
        - Some 0.5 - 0.25%
        - Trace <0.25%

A complete description of NAPL must include the following:

- Color
- Density (compared to water—e.g., light/floats or heavy/sinks)
- Odor (if observed)

- Viscosity (e.g., mobile/flowable, non-mobile/highly viscous-tar like)

The presence of an iridescent sheen by itself does not constitute NAPL presence, but may indicate NAPL presence in the vicinity.

Representative portions of the soil sample may need to be retained for geologic record following description. If required, place the soil portions into labeled, sealable clean sample containers (usually mason jars) without destroying any apparent stratification.

4.2 Chemical Sample Preparation and Packaging

The following describes the collection of grab samples for chemical analysis (all soil from one split spoon).

4.2.1 Clayey Soils

1. Discard upper and lower ends of sample core (±3 inches)
2. Use a pre-cleaned stainless steel putty knife or spatula
3. Cut the remaining core longitudinally
4. With a sample spoon remove soil from the center portion of the core and place in a pre-cleaned stainless steel bowl
5. Remove large stones and natural vegetation debris
6. For samples to be submitted for volatile organce compounds (VOC) analysis, collect soil from the length of the center portion of the core and place in the sample container until it is completed filled. For other analysis (e.g., metals), homogenize the soil and place directly into the sample jars

4.2.2 Sandy Soils

Since sandy soils have less cohesion than clayey soils, it is not easy to cut the core longitudinally to remove the center of the sample. Therefore, scrape away surface soils that have likely contacted the sampler with a stainless steel spoon, and then sample the center portion of the soil core. Immediately place all soil samples collected for chemical analysis in a cooler with ice.

All soil samples shall be recorded in the sample log book and labeled according to SOPs FM-13.4 and 13.5.

EPA adopted methods for sampling soils for VOC analysis. Method 5035 calls for collecting soil using a coring device (refer to SOP FM-9.3). For analysis of low level VOCs (typically 1 to 200 µg/kg), soil is sealed in a specially prepared vial with a solution of sodium bisulfate. For higher levels of VOCs, the soil is placed in a vial with a volume of methanol. This method increases the complexity of collecting soils and makes it imperative that the sampler and laboratory work closely together.

4.3 Geotechnical/Hydrogeologic Sample Preparation and Packaging

When a sample is collected for geotechnical or hydrogeologic properties, the sample needs to be prepared and packaged in a manner to maintain its physical properties. The following describes the collection of grab samples for geotechnical or hydrogeologic purposes for two common samplers, the split spoon and the thin wall samplers (Shelby Tube).

4.3.1 Split Spoon Sample

Following completion of PID screening, remove and dispose of soil at the top of the sample that is visibly sloughed material not representative of the soil at the sampled depth. Measure the length of the sample and record as the recovered length. If cohesive, perform pocket penetrometer reading. Carefully transfer sample onto a sheet of aluminum foil, taking care to maintain structure and bedding of the sample as much as possible. This may not be possible with non cohesive soils with low silt or clay contents. The sample may need to be packaged in three 6 to 8 inch segments. Roll the sample in the aluminum foil and fold over the ends to seal. Wrap in a second layer of foil. Identify the top, middle, and bottom segments with a T, M, and B using an indelible marker. For each segment, record the “up” direction with an arrow. Place the foil-wrapped sample in a plastic bag and write the sample identification on the bag using an indelible marker. Storing the sample in foil, as opposed to a jar, has the advantage of retaining the soil's in place structure and prevents loss of moisture. If the soils are sandy and it is not possible to retain the soils structure by rolling it in foil, packaging the sample in a jar is also acceptable, provided the jar is filled to eliminate air space, which could result in the soil drying out.

4.3.2 Shelby Tube Sample

Remove visibly sloughed material from the top of the sample using a putty knife, trowel, or similar long-bladed instrument. If it is not possible to distinguish sloughed soil from intact soil, do not remove. Following removal of sloughed material, measure the tube length and the air space in the tube above the sample and record the difference as the sample recovery. In the unusual circumstance that there is also air space at the bottom of the sample, subtract this as well and record this latter measurement as a separate entry.

Seal the top and bottom of the sample with wax (wax is normally provided and prepared by the driller). First, pour the liquefied wax into the top of the sample to a thickness of about 1 inch and let cool sufficiently. Next, remove approximately 1/2 inch of soil from bottom of sample (unless there is already a cavity at bottom of sample) and seal similarly.

Fill the remaining air space above the sample with loose soil to prevent the sample from shifting in the tube, and then close both ends of the sample with plastic caps. Tape the caps using duct tape, then write the sample identification number on the cap using an indelible marker.

Shelby tubes containing soft clays and wet silts need to be handled with care to avoid damage to the sample. Keep samples in an upright position at all times and transport in a specifically

designed cushioned box or position in your vehicle with cushioning under and around the individual tubes.

5. Records

5.1 Field Notes

The field notes must document all the events, equipment used and measurements collected during the sampling activities. The field notes must be legible and concise so that the entire soil sampling event can be reconstructed later for reporting purposes.

Standard Operating Procedure

SOP #:	FM-4.0 Rev. 002
Review Date:	04/14/2023
Origin Date:	03/01/2016

Title: Drilling Protocol

1. Purpose/Scope

The objective of this standard operating procedure (SOP) is to prevent damage to subsurface structures (including tanks, product lines, water lines, gas lines, electrical service, etc.) during drilling, Geoprobing/direct push sampling, augering, sampling, or other advancement operations.

This protocol establishes the requirements for on-site drilling operations, addressing the key issues and activities associated with safe drilling and boring operations.

2. References

ASTM D6235-18: Standard Practice for Expedited Site Characterization of Vadose Zone and Groundwater Contamination at Hazardous Waste Contaminated Sites, 2018

ASTM D5434-12: Guide for Field Logging of Subsurface Explorations of Soil And Rock, 2012

ASTM D5781-18: Guide for Use of Dual-Wall Reverse-Circulation Drilling for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5782-18: Guide for Use of Direct Air-Rotary Drilling for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5783-18: Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5784-18: Guide for Use of Hollow-Stem Augers for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5872-18: Guide for Use of Casing Advancement Drilling Methods for Geoenvironmental Exploration and Installation Of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5875-18: Guide for Use of Cable Tool Drilling and Sampling Methods for Geoenvironmental Exploration and Installation of Subsurface Water Quality Monitoring Devices, 2018

ASTM D5876-17: Guide for Use of Direct Rotary Wireline Casing Advancement Drilling Methods for Geoenvironmental Exploration and Installation of Subsurface Water Quality Monitoring Devices, 2017

ASTM D6169-21: Standard Guide for Selection of Subsurface Soil and Rock Sampling Devices for Environmental and Geotechnical Investigations, 2021

ASTM D4700-15: Guide for Soil Sampling from the Vadose Zone, 2015

ASTM D1586-18e1: Test Method for Penetration Test and Split Barrel Sampling of Soils, 2018

ASTM D1587-15: Practice for Thin Walled Tube Geotechnical Sampling of Soils, 2016

ASTM D4220-14: Practices for Preserving and Transporting Soil Samples, 2014

ASTM D6001-20: Guide for Direct Push Groundwater Sampling for Environmental Site Characterizations, 2020

3. Responsibilities

3.1 Project Manager

The Project Manager (PM) will be responsible for fulfilling the objectives of this protocol by ensuring that this procedure is carried out by all of the employees, subcontractors, and any other person acting on behalf of Groundwater & Environmental Services, Inc. (GES). The PM will also ensure that the Loss Prevention System (LPS) is implemented during the drilling project that will include but not be limited to: ensuring staff understand the need to conduct Loss Performance Self Assessments (LPSAs), review and understand activity-specific Job Loss Analysis (JLA) forms, and schedule Loss Prevention Observations (LPOs) as necessary.

The PM will ensure that all individuals working on drilling projects are adequately trained and supervised.

3.2 Site Supervisor

The Site Supervisor will practice sound investigation and drilling practices and employ all necessary measures to avoid damage to subsurface product systems and structures. The supervisor will also be responsible for ensuring that each appropriate JLA is reviewed by the

project staff prior to project activities each day and immediately following the lunch-time break.

A LPO must be conducted by the PM on the individual who is providing oversight for the first time during the first or second day of the project. Depending on the outcome of the LPO, additional LPOs may be necessary.

The PM will be the point of contact for the Site Supervisor in the event an exception to this protocol is requested.

3.3 Case Manager

The Case Manager (CM) is responsible for providing field personnel with a sampling work plan and schedule. In addition, the PM or CM will provide field personnel with enough information to perform the work safely and correctly. This information should include the operational and safety procedures that are applicable to the work being performed.

4. Equipment/Materials

- Drilling rig appropriate to investigation goals and site conditions.
- Drilling tools required to complete borehole of required depth and diameter.
- Pavement saw or jackhammer to cut asphalt or concrete, if required.
- Hand tools required to clear drilling location.
- Air knife and air compressor to hand clear drilling location, if applicable.
- Minimum personal protective equipment (PPE): Steel-toed safety shoes, safety glasses, hard hat, reflective vest or safety orange or yellow clothing, gloves (leather work gloves, Kevlar gloves, latex or nitrile gloves).
- Plastic sheeting or steel drums to stage drill cuttings.
- Plastic trash bags for refuse.
- Cones, flags, caution tape, and signage appropriate for site control.
- Apparatus and materials required for the completion of split-spoon soil sampling (see SOP FM-9.2).
- Decontamination equipment (potable water, pressure washer, steam cleaner, scrub brushes, detergent, wash buckets) as appropriate.
- Sand, bentonite, grout, or materials appropriate for borehole abandonment.

- Cold patch asphalt, concrete, or materials appropriate for pavement restoration, if required.
- Materials required for proper soil sample management (see SOP FM-13.5).

5. Preparation

- Review site-specific Work Plan and field work directive with PM.
- Obtain client approval of selected soil boring locations, if applicable.
- Notify One-Call system or appropriate agency to mark-out utilities a minimum of 72 hours in advance.
- Conduct site visit, if appropriate, to check proposed drilling locations, map utilities, establish traffic control plan, and notify site personnel of upcoming work.
- Notify property owner, site manager, or appropriate site personnel at least 24-hours in advance of completing field activity.
- Locate all subsurface utilities according to GES' Subsurface Clearance Protocol.
- Locate all overhead utilities.
- Workers shall wear appropriate PPE as specified in the site specific Work Plan. Additional PPE may be required based on air monitoring results, contaminants of concern, or site-specific conditions.
- The work area shall be appropriately secured according to the practices outlined in SOP FM-1.3.
- The Site Supervisor shall conduct air monitoring in accordance with the site-specific Health and Safety Plan (HASP).
- If drill cuttings are expected to be generated, set up a staging area for drums or build a containment pad for a cuttings pile with plastic sheeting. All soil piles shall be covered with plastic sheeting at the end of each work day. Refer to SOP FM-14.1.

6. Procedure

6.1 Pre-Drilling Procedure

6.1.1 Preparation Tasks

The Site Supervisor is responsible for reviewing the site-specific Work Plan and field work directive with the PM.

6.1.2 Obtain Permits

The PM is responsible for following all local, state, and federal laws, obtaining all necessary permits and utility clearances, and securing site access permission.

6.1.3 Obtain Site Plans

The PM or CM shall obtain as-built drawings and/or site plans as available.

> *Note: As-built drawings may not accurately depict the locations of improvements and subsurface features should therefore not be solely relied upon to determine drilling locations. Visually check positions when drilling near sewers. Personnel should also be alert to the presence of additional piping if the plans are outdated.*

6.1.4 Mark-outs

The PM is responsible to ensure the One-Call system or appropriate agency is notified to mark-out utilities a minimum of 72 hours in advance.

The Site Supervisor must conduct a walkthrough of the site to locate all main electrical, gas, telephone, and all other subsurface utilities. A Site Walkthrough Utility and Service Line Determination Record (Attachment A) was developed to assist the Site Supervisor in identifying above ground and subsurface utilities. On third party sites, close coordination with the site owner's representatives for mark-outs, review of as-builts, and other information reviews should be conducted prior to work.

A private utility mark-out company should be contracted prior to performing subsurface activities so that the approximate location of any potential subsurface utility line is identified near the areas to be drilled. For any utility line identified, a “soft-dig” contractor should be utilized to verify the location and depth of the lines, as well as the size and type of line.

> *Note: If subsurface improvements are identified within an area, the method utilized during the private utility mark-out must be adequate to identify the utility prior to any subsurface activities (e.g., GPR survey).*

6.1.5 Pre-Drilling Meeting

Prior to the start of the project, a pre-drilling meeting must be held onsite that includes the local Operations Manager (OM) or their designee (i.e., PM), the Regional Health and Safety Officer (RHSO), designated site supervisor, and the subcontractor(s) procured to perform the work. The property owner, site manager, or appropriate site personnel is to be notified at least 24-hours in advance of completing any field activity.

The pre-drilling meeting activities shall include but not be limited to: a site walk to delineate and determine all above ground utility and service lines, review project health and safety requirements, review planned drilling or boring locations, discuss the anticipated project schedule and other pertinent project information.

6.1.6 Utilities

The locations of the following should be determined:

- Electrical lines, control boxes, and appliances
- Electrical breaker boxes
- Gas lines
- Pipelines
- Fiber optic lines
- Steam lines, water lines
- Sanitary and storm-water sewer lines
- Pressurized airlines
- Underground storage tanks and associated vent and dispensing lines
- Cable lines

  Note: Drill Rigs and vehicle super structures shall be a minimum of 10 feet from overhead electrical lines for lines rated 50 kV or below. For lines over 50 kV the clearance must be 10 feet PLUS 0.4-inches for each 1 kV over 50 kV (1926.550(a)(15)(i&ii) Subpart N).

6.1.7 Product Systems

If possible, speak with someone with historical site knowledge to gain information about the site (locations of former tanks, lines, etc.).

6.1.8 For Underground Storage Tank (UST) systems

- When possible, inspect for the presence of a dispenser pan and determine whether piping is rigid or flexible.
- Visually inspect the location of the tank field, observation wells (if present), dispensers, and vent stack(s).
- Document the orientation, arrangement, location, sizes, etc. of the tanks and manholes. Determine the burial depth of the tank field.
- Observe paving scars (i.e., fresh asphalt/concrete patches, scored asphalt/concrete).

Note: This may indicate the location of product piping or other utilities.

- Document the location of the emergency shut off switch to the dispensers and become familiar with its use.

6.1.9 Existing Remediation Systems

- Visually inspect the location of above ground components.
- Document the location of well manholes, sparge points, etc.

6.2 Selection of Drilling Locations

Document, communicate and review the selected drilling locations.

6.2.1 Define Critical Zones

A critical zone is defined as an area within:

- 10 feet of the perimeter of the UST area,
- 10 feet of the drip line of the dispenser/rack canopy,
- 10 feet of product/vent/instrument lines, gas lines, electrical conduits, sewer lines, water supply lines, telecommunications lines,
- All areas between the UST and the dispensers, between the dispensers/rack and the store/office building and within street utility corridors (typically within a right-of-way easement).

6.2.2 The Site Supervisor shall establish the following drilling critical zones

- 10 feet from the furthest edge of any operating tank
- 10 feet surrounding operating dispenser islands
- 10 feet surrounding marked or know utility locations
- At active service station sites, the entire area between the tank field and the dispenser islands and the area between two or more dispenser islands

The Site Supervisor should utilize the information collected to this point in combination with regulatory requirements and investigation objectives to select drilling locations. If possible, the Site Supervisor should avoid selecting locations within the critical zone.

Review Selected Locations with the Client and with the PM.

Note: The Site Supervisor must not proceed with the investigation until the plan has been discussed with the client and approval to proceed has been granted. If relocation of a boring is necessary at any time and for any reason outside approved limits, the Site Supervisor must contact the client and GES PM prior to proceeding.

6.2.3 Required Notifications

Notify affected parties of planned work and avoid scheduling conflicts with other remediation or facility activities at the site. The Site Supervisor will notify the following persons as applicable:

- PM
- Site Manager/Operator for active locations
- Property Owner for private properties, when possible

6.3 Procedure for On-Site Drilling

Identify, to the fullest extent possible, any improvements present in the subsurface prior to advancing drilling tools in order to prevent damage to the improvements.

6.3.1 Safety

- A HASP must be available onsite at all times and all employees and subcontractors must be familiar with attached JLAs and other information.
- All work areas shall be secured with safety cones, safety tape, construction fence, other barriers, or signs as appropriate. If construction of the drilling water containment is necessary, it must be completed in accordance with guidance provided in **Attachment C**.
- The Site Supervisor should locate the emergency shut off switch for the dispensers and shall ensure all site personnel are familiar with their use.
- A fire extinguisher and "No Smoking" signs must be present at all times.
- The Site Supervisor shall complete the Drilling Protocol Checklist (**Attachment B**) prior to commencing drilling operations.

6.3.2 Supervision

- The Site Supervisor will be responsible for drilling operations and must have a copy of the Drilling Protocol on-site.
- All surface removal, hand auger digging, and drilling will be performed, observed, or supervised by the Site Supervisor at all times.

- The Site Supervisor will ensure that the work is performed with due caution and will be alert for warning signs that could indicate the presence of underground lines or other subsurface structures (i.e., tanks).
- If any such indications arise, the work should immediately cease in the area and the PM shall be contacted.

6.3.3 Warning Signs

The following warning signs may indicate the presence of subsurface structures (i.e., tanks/lines):

- Pea Gravel, Sand, or other fill material.
- The absence of soil recovery in the hand auger. This could indicate pea gravel that has spilled out of the auger.
- Any unexpected departure from the native soil conditions as established in other onsite excavation/trenching digging.
- If any of the above warning signs or a suspicious condition is encountered, drilling in this area should immediately cease and the PM shall be contacted.

6.3.4 Drill Boring Sequence

- If possible, the boring sequence should be planned such that the boring furthest from any suspected underground improvements is carried out first. This is done to determine the natural subsurface conditions and to allow the Site Supervisor to recognize fill conditions.
- Least impacted locations should be completed first if possible to prevent possible cross contamination.

6.3.5 Surface Removal for Paved Areas - Paving Removal

- Sufficient paving or surface improvement should be removed to allow clear visibility of the subsurface conditions during hand augering and/or air knifing.
- Drilling in an area of high risk may warrant a larger pavement opening.
- Monitoring Well Installations: 2ft x 2ft minimum removal is suggested.
- Soil Borings/Push Type Samplers: 8 inches minimum removal is suggested.

6.3.6 Surface Removal Technique

The technique used should not pose a threat to subsurface structures. The only approved methods for completing holes within a paved area shall be to neatly saw-cut or core unless otherwise directed by the Client.

6.3.7 Subsurface Evaluation

Ensure that no subsurface improvements exist where drill or auger will penetrate.

- In critical zones, a minimum evaluation to a depth of 8 feet utilizing a non-destructive method such as hand clearing or vacuum digging is required.
- In non-critical zones, a minimum evaluation to a depth of 5 feet utilizing a non-destructive method such as hand clearing or vacuum digging is required.
- Areas where utility or service lines have been identified or within site critical zones, a minimum evaluation to a depth of 8 feet shall be completed utilizing a non-destructive method such as hand clearing or vacuum digging.

  Note: Client-specific specifications must always be satisfied with regard to hand clearing requirements. Therefore, the most conservative approach either GES or our client's requirement must be implemented.

6.3.8 Approach

The method used to identify the subsurface should be compatible with the inherent risk associated with the type of facility / property, and the location of the drilling. Only tools approved shall be used for probing, and digging.

*Note**:** The Site Supervisor should discuss tool requirements with the Client. Also, no subsurface activities are permitted within a critical zone until the client and the GES client Program Manager is notified of the planned activity.*

- Vacuum Digging: Vacuum digging has proven to be a very effective and safe means of digging and should be used unless the soil or other material prevents the use of a vacuum digging device.
- Probing: If probing is necessary, it should occur by using a blunt or rounded tip and should be advanced by hand without excessive force. Digging bars, pry bars or other digging tool that may result in damage to subsurface utilities are not permitted.
- Hand Digging: Should be performed with a small spade shovel.
- Hand Augering: The auger is to be turned slowly and not forced through the soil. It is recommended that an auger without sharp points (some augers have rounded edges) be used.

- Post Hole Digging: Can be used for soil removal only in soil that has been probed and cannot be used to advance the hole beyond the depth or width of probing.

  Note: In the event a drilling location is selected where it's apparent that additional soil or other fill material has been placed/added to the original ground surface level where utility or service lines have been identified (i.e., sloped area next to an existing building, landscaped area, etc.), the depth of the added soil will need to be taken into account or added to the required hand clearing depth.

Approval to deviate from this work scope may be granted on an exception basis for specific situations, such as undeveloped land. In addition, the GES Site Supervisor (oversight person) must stop all project activities and discuss the situation with the GES PM or OM when client or GES requirements cannot be implemented or when site conditions result that are not consistent with normal conditions.

Evaluation of the subsurface should ideally be accomplished by probing followed by soil removal using critical and non-critical zone guidelines as a minimum.

Additional exploratory methods (e.g., water drilling, electronic screening), which will achieve at least the same level of precautionary investigation and/ or drilling safety, should be reviewed with the PM prior to implementation.

The First 5 Feet:

The area to be evaluated shall not exceed the diameter of the largest tool (hand auger, drill auger, sampling tube, etc.) to be advanced and sufficiently large to allow for visual inspection of any obstructions encountered.

- The first 1–2 feet can be cleared by hand digging to remove the soil.
- Next, probe throughout the area to ensure that no obstructions exist anywhere near the potential path of the drill auger or push type sampler.
- Probing shall extend as far laterally as possible. Hand auger or vacuum digging can then proceed but only to the depth that has been probed.
- The soil in the area shall be fully removed during this step. Alternate probing with soil removal until the first 5 feet has been evaluated. If subsurface characteristics prohibit effective probing; a hand auger may be carefully advanced past the point of probing.
- In this event, sufficient soil borings must be placed to ensure that the soil in the area is fully removed.

The Last 3 Feet:

- For boring locations outside the critical zone, probing an additional 3 feet is recommended.

- For boring locations inside the critical zone, probing an additional 3 feet is required.
- If probing is met with refusal, then trained personnel should advance a hand auger without excessive force.

6.3.9 Refusal

Where natural subsurface conditions (e.g. cobbles/rocks, fill material, and/or bedrock) may prevent adequate probing and augering, a practical and sensible evaluation by the Site Supervisor will be the basis for determining if continuation of probing and augering is feasible.

In all cases the Site Supervisor must employ all means necessary to prevent damaging subsurface product lines and tanks.

When conventional means of probing and augering cannot be utilized or the Site Supervisor feels that additional probing/augering is not feasible, they must cease work in that specific area and contact the PM to discuss the matter.

6.3.10 Event Notification

If any portion of a utility or other subsurface structures is encountered or if there is suspicion that one has been encountered, all work shall be halted, emergency conditions secured, and the client notified immediately.

If there is suspicion that the structure has been damaged, the emergency shut-off switch should be activated if applicable, and the PM should be notified immediately.

The client should decide if additional hand clearing is required. If it is confirmed that utilities have been encountered, the client should be consulted to determine what actions should be taken, such as performing a tightness test(s).

> *Note: Under no circumstance is the area to be backfilled without notifying the client and receiving an approval to proceed.*

6.3.11 Scheduling

Since evaluating the subsurface may be time-consuming, it may be appropriate to perform it prior to the drill rig's arrival on-site.

If these activities are conducted prior to the actual drilling day, the augered holes must be adequately covered with road plates and/or backfilled. Care must be taken to prevent settlement of the material used to cover the holes.

In remote, idled, or access controlled sites, augered/probed holes can be left open during fieldwork. A red hazard cone shall be placed over each penetration that will not be drilled the same day.

7. Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly as outlined in the Sampling and Analysis Plan (SAP). Clothing (PPE), tools, buckets, brushes, and all other equipment that cannot be reused will be disposed of as discussed in the SAP.

8. Records

8.1 Field Notes

The field notes must document all the events, equipment used, and measurements collected during the activities. The field notes must be legible and concise so that the entire sample event can be reconstructed later for future reference.

Record field notes in a standard bound survey-type field book issued for general note taking/field records and available from all GES equipment administrators. Make all field book entries black ink and make any changes/corrections with a single strikethrough line. Initial and date to indicate who made the change/ correction and when it was made.

9. Follow-Up Activities

Perform the following once field activities are complete.

- Clean and return equipment to the equipment administrator and sign and date the appropriate form.
- Complete purge water and cleaning fluid disposal requirements per the Work Plan.
- Complete the appropriate forms and data sheets. Send a copy to file, along with any field notes.
- Return site/well keys.

Attachments

Attachment A – Site Walkthrough: Utility and Service Line Determination Record

Attachment B – Drilling Protocol Checklist

Attachment C – Containment Construction

Attachment A – Site Walkthrough: Utility and Service Line Determination Record

Name of Person Performing Walkthrough:_____

Project / Site Location:_____ Date:_____

Utility	Description of Location Found Onsite	Approximate Depth Below Ground Surface	Method Used to Determine Location
Electrical lines			
Gas lines			
Pipelines			
Stream lines			
Water lines			
Sanitary and Stormwater Sewer lines			
Pressured air lines			
Tank vent lines			
Optical fiber lines			
Underground Storage Tanks			
Other			

Attachment B – Drilling Protocol Checklist

Site Supervisor:_____ Date:_____

Prior To Site Visit:	YES	NO	N/A
Obtained necessary permits			
Obtained Site Plans			
Visually inspected location of above ground components			
Note location well manholes, sparge points, etc.			
Document selection of drilling locations			
Define the “Critical Zones”			
Review selected locations with PM			
Conduct Utility Mark Out			
Site Visit:			
Note location of utility mark-outs and above ground utilities (Complete Walkthrough Record)			
Compared Site Plan to actual conditions			
Updated Site Plan, if necessary			
UST Systems:			
Inspected for presence of dispenser pan			
Inspected location of tank field			
Noted orientation, arrangement, location of tanks, manholes			
Noted location of Emergency Shut Off Switch			
Determined burial depth of tank field			
Noted paving scars			
Existing Remediation Systems:			
Visually inspected location of above ground components			
Note location well manholes, sparge points, etc.			
Document selection of drilling locations			
DEFINE THE “CRITICAL ZONES”			
Notified all affected parties of planned work			
Copy of Pre-Drilling Protocol available for site			

HASP available for site			
Fire extinguisher and First Aid Kit available for site			
“No Smoking” signs available for site			
Safety Cones, Safety Tape, Construction Fence, other barriers available for site			
Developed Scope of Work and reviewed with all concerned			

Attachment C – Containment Construction

JOB LOSS ANALYSIS	DATE 7-22-05	☒ NEW ☐ REVISED	PAGE 1 of _____

JLA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (DESCRIPTION)
Monitoring well drilling	Well Construction Preparation	Containment Cell Construction

Development team	Position / Title	Reviewed By:	Position / Title
D. Demko	Project Coordinator		
T. Baylis	Director of Health & Safety		

Required and / or Recommended Personal Protective Equipment

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES _____
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER _____
☐ LIFELINE/BODY HARNESS	☐ HEARING PROTECTION	☐ PPE CLOTHING _____	
☒ SAFETY GLASSES	☒ SAFETY SHOES _____		

[1]Job Steps	[2]Potential Hazards	[3]Critical Actions
Determine type of drilling to occur at job site (ie: air rotary, auger etc.)	None	Review with drilling contractor type, method and needs of drilling technique to be used.
Review background geology and anticipated contaminant to be encountered at job site. Inspect job site location.	None	Collection of accurate data on site specific hydrogeology and contaminants for analysis.
Define the management and disposal process for collection and removal of drilling returns	None	Set up containment, transportation and storage logistics for management of drilling returns.
Assess site specific location for containment cell construction	Hazards relative to the proposed drilling location	Assess topographic slope and land surface features; assess potential receptors in area of activity

Design containment cell to hold the desired volume of drilling fluids; select appropriate materials to maintain cell integrity and install containment cell	Hazards associated with handling materials, working with building tools.	Must design the containment cell to hold sufficient volume of fluids for rate of drilling fluids return/collection; must select the proper materials for cell construction based on cell volume and cell location.
Ready the components of fluid removal from the cell, transport and storage/disposal locations to ensure adequate capacity	Hazards associated with equipment movement and handling of drilling return materials.	Proper assessment and inspection of the containment cell construction and review of transport/storage elements for fluids management prior to drilling startup.
Preparation of a contingency and response plan based on containment cell failure	Loss of cell contents may pose hazard to personnel working near the cell structure.	Assess risk to personnel and the environment based on cell location and potential migration of contents from a loss scenario.
Develop a communication protocol between the driller and site geologist to cease drilling when a pre-determined level of fluids in containment cell is reached.	Hazards associated with monitoring well construction and operation around a drilling rig.	Must determine an appropriate level for cell volume liquid containment/storage based on cell construction characteristics and placement location.

[1]Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2]A hazard is a potential danger. Break hazards into five types: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards.

[3]Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Standard Operating Procedure

SOP #:	FM-5.4 Rev. 005
Review Date:	01/20/2025
Origin Date:	03/01/2016

Title: Monitor Well Design and Construction

1. Purpose/Scope

This standard operating procedure (SOP) provides instructions to design and install monitor wells in various types of subsurface materials.

2. References

ASTM D5092 / D5092M-16: Standard Practice for Design and Installation of Ground Water Monitor Wells, 2016

ASTM D5092-04: Standard Practice for Design and Installation of Ground Water Monitor Wells in Aquifer, 2004

ASTM D6724 / D6724M-16: Standard Guide for Installation of Direct Push Groundwater Monitoring Wells, 2016

ASTM D5474-93: Guide for Selection of Data Elements for Ground Water Investigations, 2012

ASTM D5787-20: Standard Practice for Monitor Well Protection At or Near Land Surface, 2020

ASTM F480-14: Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80

3. Equipment/Materials

- Equipment and materials necessary to complete soil and/or bedrock drilling of boreholes where the wells will be installed (FM-4.1).
- Well slot sized to match the filter pack material, and the filter pack material sized to match the geologic strata as outlined in the Work Plan or in discussion with the Project Manager (PM).
- PVC, stainless steel, or steel well screen and/or riser pipe.
- Protective steel riser and locking cap or flush mount cap, as required by Work Plan.
- Bentonite chips to place above filter pack materials in annulus as per Work Plan.
- Grout, grout mixer, and tremie pipe to install grout in borehole annulus.
- A commonly keyed well lock.
- A water level gauge.

- A field notebook or other field form to record well construction information.
- Proper personal protective equipment (PPE) per site-specific Health and Safety Plan (HASP).

4. Preparation

- Written specifications for design and construction of wells should be prepared and in accordance with regulatory requirements, client standards, GES practices, and industry best practices. A written request for proposal/quotation (RFP/RFQ) should be provided when subcontracting drilling services.
- Review investigation and/or corrective action Work Plan with PM.
- Ensure availability of subcontractors, equipment, and materials necessary to complete soil and/or bedrock drilling of boreholes where the wells will be installed (FM-4.1).
- Confirm well design and constructing from PM and/or Work Plan.
- Confirm contaminants to be monitored and ensure compatibility with well materials.
- Confirm geologic/hydrogeologic conditions at the site.
- Confirm the anticipated total depth and desired screen interval of the well.
- Confirm if the well is going to serve for monitor, pumping test, injection, or extraction purposes.
- It is to be noted that the selection of well locations prior to drilling should always avoid low areas, which are subject to surface water ponding.

5. Procedure

The following presents the field procedure requirements and techniques for the completion of overburden and bedrock monitor well installations.

5.1 Well Installation - Standard

- The borehole shall be drilled as close to vertical as possible. Slanted boreholes shall not be acceptable unless specified in the design.
- Ensure the borehole diameter is sufficient for well construction – local requirements may apply.
- Ensure a minimum 2-inch (5 cm) annular space between the well casing and borehole wall.
- Measure the well assembly (i.e., well screen and riser components) to record its total length, and the length of each component prior to insertion into the augers or borehole.

- The well casings and the well screen shall be placed into the borehole and plumbed to be vertical.
- No lubricating oils or grease shall be used on casing threads.
- No glue of any type shall be used to secure casing joints.
- Welded joint construction is acceptable.
- Centralizers may be used to plumb a well greater than 50 feet (15 m) deep, but they shall be placed below the well screen and above the bentonite seal such that the placement of the filter pack, bentonite seal, and annular grout will not be hindered.

5.2 Well Installation – Double Casing/Bedrock

Double-cased wells shall be constructed when there is reason to believe that interconnection of two aquifers by well construction may cause cross contamination or if overburden needs to be isolated from bedrock well installations.

- Drill a boring through the overburden and/or the contaminated zone into a confining layer (clay) or bedrock.
- Extend the borehole and outer casing a few feet into the upper layer of the confining layer or into competent bedrock. The depth of penetration will depend upon the thickness of the confining layer and regulatory requirements but usually only a few feet are needed.
- Place an outer casing (sometimes called surface casing) into the borehole and grout in place using either of the Immersion or the Pumping Methods.
- Outer casing and grout should be allowed a 24-hour period to cure prior to resuming drilling.

5.2.1 Immersion Method

- Drill borehole.
- Fill borehole with grout.
- Insert casing that has bottom end plugged with grout (previously placed and set) into borehole (water may be added inside casing to overcome buoyancy).
- Tap casing into confining layer or bedrock.

5.2.2 Pumping Method

- Drill borehole.
- Insert casing into borehole.
- Insert grout pumping tube and inflatable packer into casing.
- Inflate packer (with grout pumping tube extending through center of packer).

- Pump grout through packer until grout return is noted at surface from around outside of casing.
- Tap casing into confining layer or bedrock.
- Remove packer and grout tube.

5.3 Filter Pack Placement – Primary Filter Pack

- Select the elevation for the top of the filter pack in the field based upon the geologic conditions encountered.
  - For shallow overburden wells, it is common to extend the filter pack to the top of the water table plus a few extra feet to account for the anticipated seasonal fluctuation of the water table.
  - For deeper overburden wells, it is common to select a specific hydrogeologic unit to monitor.
- The filter pack should span that specific hydrogeologic unit only.
- The filter pack should never extend through a confining layer causing two or more separate permeable layers to become connected.
- Whenever practical, the filter pack should extend a minimum of 2 feet above the top of the well screen.
- The filter pack should be placed by the tremie method (placing the primary filter pack by pouring directly into the wellbore may be acceptable if you are sure that the filter pack is reaching the assigned depth).
- Primary filter pack placement must be performed concurrent with the removal of the augers when collapsing borehole conditions exist.
- The filter pack level must be maintained within the augers or temporary casing to ensure that the pack fully surrounds the well screen.
- If sand or filter pack is flowing up into the augers, add potable water within the augers to maintain a positive pressure head on the formation materials.
- If potable water is added, the volume used must be recorded and additional purging volumes may be required.

5.4 Filter Pack Placement—Secondary Filter Pack

Deeper wells (>60 feet) should consider a Secondary Filter Pack to avoid contaminating the well screen with grout leaking through the Primary Filter Pack under higher head pressures.

- Use a finer grained version of the same or similar materials as Primary Filter Pack.

- Install on top of Primary Filter Pack using tremie methods.
- Secondary Filter Pack should be minimum 2 feet if used.

5.5 Annular Seal (Plug)

- The grout shall be prepared in accordance with the manufacturer's specifications.
- Place a solid, pure bentonite chip pellet seal on top of the filter pack. Bentonite in either pellet (chip) or granular form is acceptable as long as it does not expand too fast under water and cause a bridging in the annular space. Pour bentonite chips in shallow boreholes [less than 50 feet (15 m)] where the annular space is large enough to prevent bridging and to allow measuring to ensure that the bentonite has been placed at the proper intervals.
- The bentonite seal should be placed above the filter pack to the designated depth or a minimum of at least 2 feet (0.6 m) above the filter pack.
- Allow the bentonite to hydrate before initiating the next backfilling operation (grouting).
- Hydrate the chips with potable water.

5.6 Annular Seal (Grout)

- The annular space between the well casing and the borehole wall should be filled with either a neat cement grout or cement/bentonite grout.
- The grout shall be placed into the borehole using positive displacement techniques and the tremie method.
- The grout shall be placed from the top of the bentonite seal to within 2 feet (0.6 m) of the ground surface or below the frost line, whichever is greater.
- The grout shall be allowed to set for a minimum of 24 hours before a surface pad is installed.
- After 24 hours, check grout level and add additional grout, if necessary.
- In cases where surface pads are not used, the grout should be brought to within 6 to 12 inches of the ground surface with the remaining height to be backfilled to match the surrounding surface conditions (i.e., asphalt, topsoil).
- The end of the grout pipe should always be submerged in the grout to ensure positive displacement.

5.7 Aboveground Riser Pipe and Outer Protective Casings

- The well casing, when installed and grouted, shall extend above the ground surface a minimum of 2.5 feet (0.75 m).
- A protective casing shall be installed over the completed well and grouted into place.

- The outer protective casing shall be of steel construction with a hinged, locking cap that is waterproof and tamper proof.
- The protective casing shall have sufficient clearance around the inner well casing, so that the outer protective casing will not come into contact with the inner well casing after installation.
- A concrete security collar shall be installed flush with the ground surface around the outer protective casing.
- The collar will be sloped to promote surface drainage away from the monitor well.
- The protective casings shall have a minimum of two weep holes for drainage and pressure equilibration to outside atmosphere.
- These weep holes shall be a minimum 1/4-inch (6.4 mm) in diameter and drilled into the protective casing just above the top of the level of concrete inside to prevent standing water inside the protective casing.
- After the wells have been installed, the protective casings shall be permanently marked with the well number on the cover or inside. When multiple wells are installed in the same borehole (nested wells), it is important to label each well during construction.

5.8 Flush Mounted Wells

- In cases where wells must be located in traffic areas, the wells will be flush-mount installations.
- When multiple wells are installed in the same borehole (nested wells), it is important to label each well during construction.
- Flush mounted wells will have a waterproof protective casing to ensure the integrity of the groundwater formation.
- A concrete pad must be installed surrounding the well manhole.
- The protective casings are grouted in place and fitted with bolts and rubber gaskets.
- The well tops are to be fitted with locking caps.
- Well caps shall be watertight screw-on connections as referenced in ASTM F-480.
- For at-grade completions, well caps shall provide a means of locking using a standard padlock.
- For above-grade completions, the well cap or well casing shall be vented with a 1/4-inch (6.4 mm) drilled hole.

5.9 Protective Posts

Protective posts (bollards) may be required in high traffic, or otherwise sensitive entry areas.

- Protective posts shall consist of either 4-inch-diameter carbon steel pipe or 4-inch by 4-inch untreated wooden posts.
- The posts shall be 5 feet (1.4 m) in overall length, and installed at least 3 feet (0.86 m) above grade.
- Up to four posts shall be provided for each monitor well and they shall be installed in concrete separate from the concrete security collar.
- The posts shall be located at the corners of the concrete collar, 4 feet from the center of the monitor well at 90-degree increments.

5.10 Weather Considerations for Concrete Pads

Restoration during or immediately prior to rain events should be avoided. Concrete typically requires 4-8 hours for initial curing. It is recommended to reschedule placing concrete if rain events are predicted for the next one to two days. If work must be completed, newly-installed concrete pads should be covered with plastic and means to divert water away from the restored area(s) should be used as needed. Proper crowning concrete pads can eliminate the need for storm water diversion. Additionally, concrete products with enhanced resistance to rain during or after installation may be selected.

Cold and freezing temperatures (i.e., when ambient temperature is less than 40° F) can adversely affect paving materials such as asphalt and concrete. When paving must be conducted in these conditions within 24 hours of paving, use cold weather methods such as insulated concrete curing blankets. Paving products (e.g., concrete) designed for cold conditions may be selected.

6. Records

Details of each overburden well installation may be recorded on the Stratigraphy Log (Overburden) or within a standard GES field book. Well Construction Detail is provided for recording the overburden well instrumentation details, and must note the following:

- Overburden and/or bedrock lithology per FM-4.1
- Well screen depth and interval
- Filter pack interval
- Bentonite seal/plug interval
- Grout interval
- Surface cap detail
- Well material, including screen size and type (i.e., factory slot or continuous)
- Any well instrumentation (e.g., pump setting, riser and screen length)

- Well diameter
- Filter pack material
- Type of seal
- Type of grout
- Stick-up/flush-mount detail
- Date installed
- Development record
- Permit information (if applicable)
- Surveyed well location and elevation per state guidelines or requirements (at minimum, develop accurate field ties to the center of the well from three adjacent permanent features and permanently marked to identify the well number designation).

7. Follow-Up Activities

Once the monitor well(s) have been installed, complete the following activities:

- Submit logs to the GES PM, who will be responsible for the review and completion of the final well log.
- Plot well locations onto site plan map, since locations may be altered in the field due to underground/overhead interferences or other conditions.
- Tabulate monitor well details.
- Prepare a summary write-up on field activities including, but not necessarily limited to such items as drilling method(s), well construction material, site geology, well development and waste management.
- Keep field log book on file at the appropriate GES office.

Standard Operating Procedure

SOP #:	FM-8.1 Rev. 004
Review Date:	06/03/2023
Origin Date:	03/01/2016

Title: Liquid Level Gauging

1. Purpose/Scope

This SOP describes procedures for collecting groundwater and Light and Dense Non-Aqueous Phase Liquid (LNAPL and DNAPL) level measurements in wells. Down-hole liquid level readings can be collected by using an oil/water interface probe, such as Solinst or Heron.

2. References

Solinst Model 122 Interface Meter Operating Instructions.

3. Equipment/Materials

The following equipment and materials are needed to comply with this SOP:

- Oil/water interface probe (e.g., Solinst) with the ability to detect light and dense non-aqueous phase liquids, LNAPL and DNAPL, respectively, and a minimum precision of +/-0.01 foot
- Clear bailer
- Field book, field form, or other approved method of water level documentation
- Records of previous water level readings and analytical data for site, if available
- Modified Level D personal protective Equipment (PPE) or as directed in task Job Loss Analysis (JLA)
- Decontamination materials

Refer to equipment manuals for general maintenance and/or troubleshooting.

4. Preparation

- Obtain a copy of previous water levels from the project manager and the appropriate field data collection form, as applicable, from the field work directive (FWD).
- Check the electronics and battery condition by pushing the 'Start' button. A brief tone and/or light indicate the meter is functional. Follow the equipment manual guidance for brand-specific tone and light indications.
- Inspect probe, probe connection to measuring tape, and optical tip.
- Transport the probe in manufacturer's bag or other suitable transport device to protect the equipment and to keep it clean.

5. Procedure

5.1 Water-Level Measurement Procedure

Liquid level measurements should follow a logical order from the least known or suspected level of contamination to the greatest. This will minimize the potential for cross-contamination between wells/monitoring locations.

1. Don the appropriate PPE per the JLA.
2. Confirm the well location on the Site Map.
3. Turn on the interface meter (e.g., pushing the “START” button) and make sure it indicates it is on through a light or tone.
4. Open the well cap.
5. If there is a potentially hazardous atmosphere, measure the breathing space above the well casing with a photoionization detector (PID) or other applicable meter to ensure safe conditions.
6. Inspect well casing for a measurement reference point (see Reference Point guidance below).
7. If being used in a potentially explosive environment, connect the grounding clip on the meter to the metal well casing or other suitable grounding point.
8. Insert the probe into the well casing.
9. Slowly lower the probe until the meter makes a steady beep with a flashing or solid indicator light. Slowly retrieve the probe until the unit stops beeping and the indicator light stops.
10. Slowly lower the probe again and immediately stop when the meter maintains a steady beep. When using an interface probe, a solid tone and light indicates product (LNAPL or DNAPL) and an alternating beep and blinking light indicates water.
    Note: For floating product (LNAPL), take the air/product interface measurement on the way into the liquid, and the water/product interface on the way up. For sinking product (DNAPL), take the water/product interface on the way down.
11. Read the tape measurement and document the readings in a field book and/or on the designated field form.
12. If depth to bottom readings are needed, continue to slowly lower the probe until the tape slackens, indicating it has reached the bottom. Slowly lift the probe up and down until the depth of impact with the bottom of the well can be determined. Record the depth in field book or on the designated form.
13. Retract the probe and decontaminate the probe (see Equipment Decontamination section below). Decontaminate the equipment after each measurement is complete.
14. Replace the well cap and lock it.
15. Repeat steps 1 through 14 at the remaining monitoring locations.
16. If NAPL is detected where it was not previously, or other unexpected or unusual findings are detected, lower a clear bailer into the well (do not fully submerge), remove the bailer, and conduct a visual inspection of the bailer and liquids for confirmation.

17. Call the Project Manager to report/discuss any unexpected findings.

5.2 Reference Point Determination

Use the reference point as imprinted on the top of the well casing as the measuring reference point. If a reference point is not present, the north side of the well casing will be used as the reference point and marked on the well casing in a manner that can be referred to during future monitoring events (e.g., notch piping with file or write with permanent marker). This will be the Point of Measure (POM) to be used when obtaining water-level measurements. Any deviation from this measuring point must be documented in the field notes and reported to the project lead.

5.3 Equipment decontamination

The water level indicator must be decontaminated after each measurement in accordance to the Work Plan requirements and manufacturers guidance. In general, wash the probe and any part of the measuring tape that came in contact with groundwater using warm water and a non-abrasive mild detergent. Rinse the probe with distilled water and wipe dry. Refer to FM SOP-14.1 for additional decontamination guidance.

After cleaning the probe, it should be placed back into the travel bag or transported to the next location in a way that will eliminate cross contamination.

Standard Operating Procedure

SOP #:	FM-5.6 Rev. 004
Review Date:	06/27/2023
Origin Date:	03/01/2016

Title: Monitor Well Development

1. Purpose/Scope

This standard operating procedure (SOP) provides instructions for developing a monitoring well after installation is completed (FM-5.4 Monitoring Well Design and Construction).

2. References

- ASTM D5092 / D5092M – 16. Standard Practice for Design and Installation of Groundwater Monitoring Wells. 2017.
- ASTM D5521 / D5521M-18. Standard Guide for Development of Groundwater Monitoring Wells in Granular Aquifers. 2018
- ASTM D5978 / D5978M-16. Standard Guide for Maintenance and Rehabilitation of Groundwater Monitoring Well. 2016.
- Driscoll, F.G., Groundwater and Wells, 2nd Edition. Johnson Division. 1986.
- Freeze, R.A. and Cherry, J.A., Groundwater. Prentice Hall, Inc. 1979.
- Resource Conservation and Recovery Act Ground Water Monitoring Technical Enforcement Guidance Document by the Environmental Protection Agency (EPA) Report 530/SW-89-055 (1986) and the EPA Handbook (1991).

3. Equipment/Materials

A checklist of suggested equipment and supplies needed to implement this SOP would be based on the selected method of development in addition to general field equipment. **Attachment A** (Drilling Geologist Equipment Checklist) presents a complete list of equipment. The general field equipment includes:

- Water interface probe
- Specific conductance/temperature/pH meter
- Surge block equipped with submersible pump
- Decontamination materials
- Wire brush and extended handle
- Plastic sheeting/towels/garbage bags

- Transportable, purged water storage container
- Bottom-loading stainless steel bailer with nylon cord
- Well construction details
- Photoionization detector (PID)
- Field book
- Proper personal protective equipment (PPE) per the site-specific Health and Safety Plan (HASP)

4. Preparation

- Review the Work Plan with Project Manager (PM) and select the method of development. Common methods are listed in **Attachment B** (Well Development Methods).
- Perform the applicable preparation activities described in SOP FM-1.5 (General Instructions for Field Personnel).
- The PM or Case Manager (CM) should obtain relevant information on each well to be developed (e.g., drilling technique, drilling fluid losses, anticipated aquifer yield, screened interval, anticipated contaminants).
- Obtain the specific equipment and materials from the Drilling Geologist Equipment Checklist (**Attachment A**).
- Decontaminate equipment used in well development per SOP FM 14.1 (Equipment Decontamination), or the Work Plan.
- Obtain sufficient containers for temporary storage of well development water. If temporary storage containers are employed on-site, Site personnel shall ensure that:
  - Containers have no leaks
  - Containers, such as 55-gallon drums, are stabilized to prevent spillage
  - Containers are field manageable (The use of truck or trailer-mounted tanks may be necessary for larger volumes of water)
  - Containers are labeled as non-potable purge water
- Obtain any necessary temporary discharge permits for on-site treatment and on-site discharge of any development water.
- Coordinate and arrange development water treatment with GES engineering division.
- Check any source(s) of water to be introduced into the borehole. Use only analyte-free water.

5. Procedure

Well development should be completed as soon as practical after well installation, but no sooner than 48 hours, unless another timeframe is specified or required by the regulatory agency.

- Open the surface protective casing and remove the well cap (if applicable).
- Where volatile organics are suspected to be present, monitor air quality at the top of the casing and in the breathing zone using a PID or other suitable monitoring instrument. Record readings in appropriate site-specific field book.
- Measure depth to water and total depth of the well according to SOP FM-8.1 (Fluid Level Gauging).
- Measure and record initial field chemical parameters (e.g., pH, specific conductivity, oxidation reduction potential (ORP), and temperature).
- Begin development activities to remove water and sediment from the well.
- Remove residual drilling mud from the casing by bailing or flushing with potable water through a tremie pipe. Introduce just enough water to remove the drilling mud.
- Segregate removed drilling mud from the formation water, if possible. Use drilling contractor's mud tank to collect un-thinned drilling mud and initial muddy formation water.
- Begin well development using a surge block/bailer/pump or approved method based on the number of well casing volumes and follow with additional development until (1) the development water becomes visually clear of suspended sediment, (2) minimum of three to five calculated well volumes of the initial standing water column has been purged, and (3) field parameters of the last three field chemical parameter measurements have stabilized to within +/-10%. Criteria for completing well development are described as follows:
    - *Turbidity criteria* – Well development shall continue until the turbidity has improved from the initial static conditions. Be sure to document all turbidity conditions in the field notes. If the well is not visually clear of sediment after the required volume of water has been removed, continue well development until twice the initial purge volume has been purged or approval to cease development activities is agreed upon by the PM or CM.
    - *Purge volume criteria* – Purge a minimum of three to five volumes of the initial standing water column, as specified in the field work directive (FWD), in each well prior to discontinuing well development. In situations where the groundwater flow from the screen interval is exceeded by the development pumping rate, the well may

temporarily dry up. Inform the PM or CM when it is determined that three to five casing volumes cannot be purged within a 12-hour period.

- *Field parameter criteria* – This criterion for well development has been met when field chemical parameters (e.g., pH, specific conductivity, ORP, and temperature) have stabilized within +/-10% over the final three series of monitoring measurements.

- If one or more of the above criteria for well development cannot be met regardless of the amount of pumping, coordinate with the PM to select an alternate procedure for verifying that the well is adequately developed.
- Record estimated drawdown and well development pumping rate. Using flow and recovery rates, estimate the discharge rate the well can be pumped while not allowing (if possible) the water level to fall below the top of the screened section of the casing. Report unsustainable or low yield estimates, or dry wells to the PM or CM.
- Collect any samples of the discharge requested by the PM or CM or required by the Work Plan.
  - Well development (WD) samples are identified differently than routine samples and should be named using the well name followed by WD (e.g., W-123-WD).
  - Well development samples should be collected after full recovery of the static water level, if practical. The static water level should be measured before sampling.
  - Note and record water volume produced during development.
- In cases where water was added to the monitoring well during the drilling activities, or air development methods were used, groundwater samples (other than WD samples) should not be collected for at least seven days after the well development activities were completed. Place purge water into an appropriate container for transport to the on-site storage area or for on-site treatment and discharge.
- Waste generated during well development activities shall be handled as outlined in FM-15.1 (Containerization and Removal of Remedial Investigation Derived Waste) and FM-20.1 (Waste Sampling) or as directed in a site specific Waste Management Plan.

6. Records

Details of each well that is developed should be recorded in a standard bound survey-type field book issued for general note taking and on the Well Development Data form (**Attachment C**). Records should include the following items:

- Chain-of-custody forms
- Well development data forms

- Well ID
- Well depth
- Static water level depth and measurement technique
- Sounded well depth
- Presence of immiscible layers and detection/collection method
- Well yield (high or low)
- Purge volume and pumping rate
- Time well purged
- Measured field parameters
- Purge device used
- Well water clarity before and after development
- Field analysis data and method(s)
- Field observations
- Name of person developing the well(s)
- Climatic conditions including air temperature
- Problems encountered and any deviations made from the established protocol

7. Follow-Up Activities

Perform the following once field activities are complete.

- Review Work Plan to ensure all work has been completed and confirm this with Project Coordinator.
- Clean and return equipment to the equipment administrator and sign and date the appropriate form.
- Complete purge water and cleaning fluid disposal requirements per the Work Plan.
- Complete the appropriate forms and data sheets. Send a copy to file, along with any field notes.
- Return site/well keys.

Attachments

Attachment A – Drilling Geologist Equipment Checklist

Attachment B – Well Development Methods

Attachment C – Well Development Data Form

Attachment A – Drilling Geologist Equipment Checklist

Date: **Reference #:**

Instruments			
☐	Water level indicator	☐	Steel measuring tape
☐	300-ft weighted tape	☐	Stopwatch or watch w/ second hand
☐	Air monitoring equipment (PID, FID, etc.)		
Supplies			
☐	Aluminum foil	☐	Core boxes
☐	Disposable Teflon or polyethylene bailers	☐	Cooler with ice
☐	Glass jars w/ preservative as req'd (w/ labels)	☐	Grain-sized sieves
☐	Imhoff cone	☐	Munsell soil/rock color chart
☐	pH paper	☐	String
☐	Teflon tape (4-inch wide)	☐	Paper towels
☐	Zip-lock bags	☐	Trash bags
☐	Plastic spray bottles	☐	Decontamination fluids
			☐ 2-Propanol ☐ Hexane (pesticide-grade)
			☐ Deionized water ☐ Methanol (pesticide-grade)
			☐ Acid rinse for metals ☐ Other
Miscellaneous			
☐	Well cap keys	☐	Spare locks/keys
☐	Toolbox	☐	Knife
☐	Steel spatula	☐	Rock hammer
☐	Buckets and brushes	☐	Camera
☐	Spare batteries	☐	Pen/pencil/permanent marker
☐	Bolt cutters	☐	Reinforced packing tape
☐	On-site transportation (ATV, snowmobile)	☐	Fire extinguisher
☐	GES ID sign for vehicle	☐	Lock deicer (winter)
Documentation			
☐	Document control logbook	☐	Well logs
☐	Notebook/field book	☐	Applicable permits
☐	Previous well logs/historical well data	☐	Site pass/badge
☐	Blank well data and other field forms	☐	Photographic log
☐	Site map		
Personal Protective Equipment			
☐	Safety glasses (or side shields w/ OSHA-approved glasses)	☐	Tyvek: ☐ White ☐ Yellow ☐ Other
☐	Nitrile or latex gloves	☐	Hearing protection
☐	Hard hats/liners	☐	Respirators
☐	Field overboots	☐	First aid kit
☐	HASP checked for other PPE	☐	Safety signage
Completed By:		**Date:**	

Attachment B – Well Development Methods

1. Well Development Methods

There are various techniques that may be effective in developing wells depending on the hydrogeologic conditions encountered in the aquifer, drilling method used, and well design. Hydrogeologic conditions may be complex and unpredictable; therefore, a single SOP cannot be developed to apply to all possible situations. Rather, the methods discussed briefly below are intended to be used as alternatives or as a series of steps to achieve acceptable well development results. Refer to the site-specific work plan for more information on the scope of work activities for determining the most appropriate method to be used for existing conditions.

1.1 Wire brushing

Running a tight-fitting wire brush up and down the interior of the well casing, screen, and sump serves to remove sediment and debris and clears the screen openings.

1.2 Bailing

In relatively clean, permeable formations where water flows freely into the well, bailing is an effective development technique. The bailer is allowed to fall freely through the monitoring well until it strikes the surface of the water. The contact of the bailer produces a strong outward surge of water. This tends to break up bridging that has developed within the formation. As the bailer fills and before it is rapidly withdrawn, the bailer is to be surged upward and downward a minimum of three feet within the water column for at least three complete cycles. The upward and drawdown effect created in the borehole causes the particulate matter outside the well intake to flow through the well intake and into the well. Subsequent bailing removes the sand and other particulate matter from the well. This is to be repeated throughout the entire screened area of the well and continued until the water is free from suspended particulate matter.

After wire brushing the well interior, the well is bailed to remove sediment and debris. The bailing method is also used as an alternative when the formation or water-producing zone fails to supply water at sufficient rates to sustain development by pumping.

1.3 Mechanical surging

Surge blocks can be used effectively to destroy the bridging of the fine formation particles and to create the agitation that is necessary to develop a monitoring well. A surge block is used alternatively with either a bailer or pump so that material that has been agitated and loosened by the surging action is removed. The surge block assembly must be of sufficient weight to freefall through the water in the well and create a vigorous outward surge. Surging begins at the top of the well intake so that sand or silt loosened by the initial surging action cannot cascade down on top of the surge block and prevent removal of the surge block from the well. Surging is initially gentle, and the energy of the action is increased during the development process. A combination of surging and pumping should continue until the water is free from suspended particulate matter.

1.4 Swabbing

A swab is a mechanical surging device that is pulled upward through the water column in a well. Swabbing may be done with single- or double-swab flanges and with or without water bypass vents. Water may be injected into the well to the formation through the swabbing tool. In this method, water flows into one part of the screen, through the filter pack and adjacent formation, and out in another part of the screen. Swabbing is an aggressive development method that may be suitable if the introduction of water is acceptable. Swabbing is not recommended for wells with plastic casing or screens.

1.5 High-velocity jetting

Jetting, or forcing water through the screen from nozzles on a pipe assembly, can clear screen openings. The jetting method is not always advisable as it forces the fines back into the filter pack and formation, and adds large volumes of water to the system.

1.6 Over-pumping

A simple method of removing fines from a water-bearing formation is by over-pumping. This method involves alternately pumping the well at a rate that will force it to become dry and allowing it to recover. Over-pumping causes an increase in the flow velocity of the water to the well intake and creates a rapid and effective migration of particulates toward the well. The over-pumping method is not always effective, particularly in unconsolidated formations, and may result in a formation that is partially developed.

Where there is no backflow prevention valve (check valve) installed, the pump can be alternately started and stopped. This backwashing produces a surging action in the well and tends to loosen the bridging of the fine particles in the formation. Backwashing can only be performed using dedicated pumps and hoses or those that have been cleaned prior to use at the well being developed. The types of pumps commonly used for well development are BK pumps, Grundfos submersible pumps, Red-jacket submersible pumps, etc.

1.7 Pump development

Pump development is commonly used as the final phase of well development after wire brushing and bailing methods have been performed. A submersible pump and packer assembly, if applicable, is installed and pumping at a sustainable rate is conducted until the water attains acceptable criteria to complete well development.

Attachment C – Well Development Data Form

By:_____ Sheet # _____of_____
Well No./Locator:_____ Date:_____
Job Name:_____ Job Number:_____
Development Method(s):_____
Depth to Water before Development (ft):_____ Sounded Depth (ft)_____
Screened Interval:_____ Spec. Depth (ft):_____ Well Diameter (ft):_____

Time	Depth to Well (ft)	Gallons Pumped	Flow Rate (gpm)	Comments

Well Development Summary			
Depth to water during pumping (ft):		Approx. yield:	
Depth to water after development (ft):		Average pumping rate (gpm):	
Sounded depth after development (ft):		Pumping rate range (gpm):	
Total pumping time (min):		Total H_2O injection (gal):	
Total amount excavated (gal):			

Note: All depths measured in feet below ground surface (bgs)

Attachment 2

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF LABORATORIES

LABORATORY ACCREDITATION PROGRAM

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certifies That

68-02089

Pace Analytical Services LLC - Mansfield MA (320 Forbes)

320 Forbes Boulevard , Mansfield, MA, 02048

Having duly met the requirement of
The act of June 29, 2002 (P.L. 596, No. 90)
dealing with Environmental Laboratories Accreditation
(27 Pa. C.S. 4104-4113) and the
National Environmental Laboratory Accreditation Program Standard
is hereby approved as an

Accredited Laboratory

to conduct analysis within the fields of accreditations more fully described in the attached Scope of Accreditation

NELAP accreditation granted by the PA DEP to an environmental laboratory is conditioned upon continued compliance with the current edition of the NELAC Standard or TNI Standard and the following Subchapters and Sections of 25 Pa. Code Chapter 252: Subchapter A (relating to general provisions); Subchapter B (relating to application, fees and supporting documents); Subchapter E (relating to proficiency test study requirements); Subchapter F (relating to assessment requirements); Subchapter G (relating to miscellaneous provisions); Section 252.307; and Section 252.401.

Expiration Date: **08/31/2025**

Certificate Number: **015**

Annmarie Beach

Annmarie Beach, Chief
Laboratory Accreditation Program
Bureau of Laboratories

Continued accreditation status depends on successful ongoing participation in the program
Certificate not transferable Surrender upon revocation
To be conspicuously displayed at the Laboratory
Not valid unless accompanied by a valid Scope of Accreditation
Shall not be used to imply endorsement by the Commonwealth of Pennsylvania
Customers are urged to verify the laboratory's current accreditation status
PA DEP is a NELAP recognized accreditation body

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 015-002 expiration date 08/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 200.7	4.4	10013806	Aluminum	1000	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Barium	1015	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Boron	1025	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Cadmium	1030	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Calcium	1035	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Chromium	1040	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Cobalt	1050	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Copper	1055	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Iron	1070	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Lithium	1080	NELAP	NH	07/17/2024
EPA 200.7	4.4	10013806	Magnesium	1085	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Manganese	1090	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Nickel	1105	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Potassium	1125	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Silver	1150	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Sodium	1155	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Strontium	1160	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Tin	1175	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Titanium	1180	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Vanadium	1185	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Zinc	1190	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Aluminum	1000	NELAP	NH	04/05/2017

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 200.8	5.4	10014605	Antimony	1005	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Arsenic	1010	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Barium	1015	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Beryllium	1020	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Cadmium	1030	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Chromium	1040	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Cobalt	1050	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Copper	1055	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Iron	1070	NELAP	NH	07/25/2018
EPA 200.8	5.4	10014605	Lead	1075	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Manganese	1090	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Nickel	1105	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Potassium	1125	NELAP	NH	07/25/2018
EPA 200.8	5.4	10014605	Selenium	1140	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Silver	1150	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Sodium	1155	NELAP	NH	07/25/2018
EPA 200.8	5.4	10014605	Thallium	1165	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Vanadium	1185	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Zinc	1190	NELAP	NH	04/05/2017
EPA 245.1	3.0	10036609	Mercury	1095	NELAP	NH	04/05/2017
EPA 522	1.0	10088570	1,4-Dioxane (1,4-Diethyleneoxide)	4735	NELAP	NH	12/22/2017

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 533	1.0	10091619	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	9490	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	1H, 1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2-FTS)	6948	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	1H, 1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2-FTS)	6946	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	1H, 1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2-FTS)	6947	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	4,8-Dioxa-3H-perfluorononanoic acid (DONA)	6951	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	6952	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Hexafluoropropylene oxide dimer acid (HFPO-DA)	9460	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	6956	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	6957	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluoro-3-methoxypropanoic acid (PFMPA)	6965	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluoro-4-methoxybutanoic acid (PFMBA)	6966	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluorobutanesulfonic acid (PFBS)	6918	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluorobutanoic acid (PFBA)	6915	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluorodecanoic acid (PFDA)	6905	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluorododecanoic acid (PFDoA)	6903	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluoroheptanesulfonic acid (PFHpS)	9470	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluoroheptanoic acid (PFHpA)	6908	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluorohexanesulfonic acid (PFHxS)	6927	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluorohexanoic acid (PFHxA)	6913	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluorononanoic acid (PFNA)	6906	NELAP	NH	09/08/2020

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 015-002 expiration date 08/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 533	1.0	10091619	Perfluorooctanesulfonic acid (PFOS)	6931	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluorooctanoic acid (PFOA)	6912	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluoropentane sulfonic acid (PFPeS)	6934	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluoropentanoic acid (PFPeA)	6914	NELAP	NH	09/08/2020
EPA 533	1.0	10091619	Perfluoroundecanoic acid (PFUnA)	6904	NELAP	NH	09/08/2020
EPA 537.1	1.0	10091642	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	9490	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	4,8-Dioxa-3H-perfluorononanoic acid (DONA)	6951	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	6952	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Hexafluoropropylene oxide dimer acid (HFPO-DA)	9460	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorobutanesulfonic acid (PFBS)	6918	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorodecanoic acid (PFDA)	6905	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorododecanoic acid (PFDoA)	6903	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluoroheptanoic acid (PFHpA)	6908	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorohexanesulfonic acid (PFHxS)	6927	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorohexanoic acid (PFHxA)	6913	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorononanoic acid (PFNA)	6906	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorooctanesulfonic acid (PFOS)	6931	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorooctanoic acid (PFOA)	6912	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorotetradecanoic acid (PFTA)	6902	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	Perfluorotridecanoic acid (PFTrDA)	9563	NELAP	NH	06/14/2019

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 537.1	1.0	10091642	Perfluoroundecanoic acid (PFUnA)	6904	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	n-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4846	NELAP	NH	06/14/2019
EPA 537.1	1.0	10091642	n-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4847	NELAP	NH	06/14/2019
EPA 537.1	2.0	10091595	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	9490	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	4,8-Dioxa-3H-perfluorononanoic acid (DONA)	6951	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	6952	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Hexafluoropropylene oxide dimer acid (HFPO-DA)	9460	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorobutanesulfonic acid (PFBS)	6918	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorodecanoic acid (PFDA)	6905	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorododecanoic acid (PFDoA)	6903	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluoroheptanoic acid (PFHpA)	6908	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorohexanesulfonic acid (PFHxS)	6927	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorohexanoic acid (PFHxA)	6913	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorononanoic acid (PFNA)	6906	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorooctanesulfonic acid (PFOS)	6931	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorooctanoic acid (PFOA)	6912	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorotetradecanoic acid (PFTA)	6902	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluorotridecanoic acid (PFTrDA)	9563	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	Perfluoroundecanoic acid (PFUnA)	6904	NELAP	NH	09/19/2024

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 537.1	2.0	10091595	n-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4846	NELAP	NH	09/19/2024
EPA 537.1	2.0	10091595	n-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4847	NELAP	NH	09/19/2024

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1631	E	10237204	Mercury	1095	NELAP	NH	04/05/2017
EPA 1633		10123463	Perfluorodecanesulfonic acid (PFDS)	6920	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorododecanesulfonic acid (PFDoS)	6923	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorononanesulfonic acid (PFNS)	6929	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoropentanesulfonic acid (PFPeS)	6934	NELAP	NH	09/19/2024
EPA 1633		10123463	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	9490	NELAP	NH	09/19/2024
EPA 1633		10123463	1H, 1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2-FTS)	6948	NELAP	NH	09/19/2024
EPA 1633		10123463	1H, 1H, 2H, 2H-Perfluorododecane sulfonic acid (10:2-FTS)	9616	NELAP	NH	09/19/2024
EPA 1633		10123463	1H, 1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2-FTS)	6946	NELAP	NH	09/19/2024
EPA 1633		10123463	1H, 1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2-FTS)	6947	NELAP	NH	09/19/2024
EPA 1633		10123463	2H,2H,3H,3H-Perfluorodecanoic acid (3-Perfluoroheptyl propanoic acid) (7:3 FTCA)	9340	NELAP	NH	09/19/2024

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320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1633		10123463	2H,2H,3H,3H-Perfluorooctanoic acid (5:3 FTCA)	9338	NELAP	NH	09/19/2024
EPA 1633		10123463	4,4,5,5,6,6,6-Heptafluorohexanoic acid (3-Perfluoropropyl propanoic acid) (3:3 FTCA)	9353	NELAP	NH	09/19/2024
EPA 1633		10123463	4,8-Dioxa-3H-perfluorononanoic acid (DONA)	6951	NELAP	NH	09/19/2024
EPA 1633		10123463	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	6952	NELAP	NH	09/19/2024
EPA 1633		10123463	Hexafluoropropylene oxide dimer acid (HFPO-DA)	9460	NELAP	NH	09/19/2024
EPA 1633		10123463	N-Ethylperfluorooctanesulfonamide (EtFOSA)	9395	NELAP	NH	09/19/2024
EPA 1633		10123463	N-Methylperfluorooctanesulfonamide (MeFOSA)	9433	NELAP	NH	09/19/2024
EPA 1633		10123463	N-ethylperfluoro-1-octanesulfonamido ethanol (N-EtFOSE)	9431	NELAP	NH	09/19/2024
EPA 1633		10123463	N-methylperfluoro-1-octanesulfonamido ethanol (N-MeFOSE)	6949	NELAP	NH	09/19/2024
EPA 1633		10123463	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	6956	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	6957	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoro-3-methoxypropanoic acid (PFMPA)	6965	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoro-4-methoxybutanoic acid (PFMBA)	6966	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorobutanesulfonic acid (PFBS)	6918	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorobutanoic acid (PFBA)	6915	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorodecanoic acid (PFDA)	6905	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorododecanoic acid (PFDoA)	6903	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoroheptanesulfonic acid (PFHpS)	9470	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoroheptanoic acid (PFHpA)	6908	NELAP	NH	09/19/2024

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1633		10123463	Perfluorohexanesulfonic acid (PFHxS)	6927	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorohexanoic acid (PFHxA)	6913	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorononanoic acid (PFNA)	6906	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorooctane sulfonamide (PFOSA)	6917	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorooctanesulfonic acid (PFOS)	6931	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorooctanoic acid (PFOA)	6912	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoropentanoic acid (PFPeA)	6914	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorotetradecanoic acid (PFTA)	6902	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorotridecanoic acid (PFTrDA)	9563	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoroundecanoic acid (PFUnA)	6904	NELAP	NH	09/19/2024
EPA 1633		10123463	n-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4846	NELAP	NH	09/19/2024
EPA 1633		10123463	n-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4847	NELAP	NH	09/19/2024
EPA 1633 (draft)	2	10123430	Perfluorodecanesulfonic acid (PFDS)	6920	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorododecanesulfonic acid (PFDoS)	6923	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorononanesulfonic acid (PFNS)	6929	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoropentanesulfonic acid (PFPeS)	6934	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	9490	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	1H, 1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2-FTS)	6948	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	1H, 1H, 2H, 2H-Perfluorododecane sulfonic acid (10:2-FTS)	9616	NELAP	NH	09/22/2023

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1633 (draft)	2	10123430	1H, 1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2-FTS)	6946	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	1H, 1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2-FTS)	6947	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	2H,2H,3H,3H-Perfluorodecanoic acid (3-Perfluoroheptyl propanoic acid) (7:3 FTCA)	9340	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	2H,2H,3H,3H-Perfluorooctanoic acid (5:3 FTCA)	9338	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	4,4,5,5,6,6,6-Heptafluorohexanoic acid (3-Perfluoropropyl propanoic acid) (3:3 FTCA)	9353	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	4,8-Dioxa-3H-perfluorononanoic acid (DONA)	6951	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	6952	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Hexafluoropropylene oxide dimer acid (HFPO-DA)	9460	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	N-Ethylperfluorooctanesulfonamide (EtFOSA)	9395	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	N-Methylperfluorooctanesulfonamide (MeFOSA)	9433	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	N-ethylperfluoro-1-octanesulfonamido ethanol (N-EtFOSE)	9431	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	N-methylperfluoro-1-octanesulfonamido ethanol (N-MeFOSE)	6949	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	6956	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	6957	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoro-3-methoxypropanoic acid (PFMPA)	6965	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoro-4-methoxybutanoic acid (PFMBA)	6966	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorobutanesulfonic acid (PFBS)	6918	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorobutanoic acid (PFBA)	6915	NELAP	NH	09/22/2023

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PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1633 (draft)	2	10123430	Perfluorodecanoic acid (PFDA)	6905	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorododecanoic acid (PFDoA)	6903	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoroheptanesulfonic acid (PFHpS)	9470	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoroheptanoic acid (PFHpA)	6908	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorohexanesulfonic acid (PFHxS)	6927	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorohexanoic acid (PFHxA)	6913	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorononanoic acid (PFNA)	6906	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorooctane sulfonamide (PFOSA)	6917	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorooctanesulfonic acid (PFOS)	6931	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorooctanoic acid (PFOA)	6912	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoropentanoic acid (PFPeA)	6914	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorotetradecanoic acid (PFTA)	6902	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorotridecanoic acid (PFTrDA)	9563	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoroundecanoic acid (PFUnA)	6904	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	n-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4846	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	n-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4847	NELAP	NH	09/22/2023
EPA 200.7	4.4	10013806	Aluminum	1000	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Antimony	1005	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Arsenic	1010	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Barium	1015	NELAP	NH	04/05/2017

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 200.7	4.4	10013806	Beryllium	1020	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Boron	1025	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Cadmium	1030	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Calcium	1035	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Chromium	1040	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Cobalt	1050	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Copper	1055	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Iron	1070	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Lead	1075	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Magnesium	1085	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Manganese	1090	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Molybdenum	1100	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Nickel	1105	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Potassium	1125	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Selenium	1140	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Silica, as SiO2	1990	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Silver	1150	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Sodium	1155	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Strontium	1160	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Thallium	1165	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Tin	1175	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Titanium	1180	NELAP	NH	04/05/2017

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Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 200.7	4.4	10013806	Vanadium	1185	NELAP	NH	04/05/2017
EPA 200.7	4.4	10013806	Zinc	1190	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Aluminum	1000	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Antimony	1005	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Arsenic	1010	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Barium	1015	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Beryllium	1020	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Cadmium	1030	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Chromium	1040	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Cobalt	1050	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Copper	1055	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Iron	1070	NELAP	NH	07/25/2018
EPA 200.8	5.4	10014605	Lead	1075	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Manganese	1090	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Molybdenum	1100	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Nickel	1105	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Potassium	1125	NELAP	NH	07/25/2018
EPA 200.8	5.4	10014605	Selenium	1140	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Silver	1150	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Sodium	1155	NELAP	NH	07/25/2018
EPA 200.8	5.4	10014605	Thallium	1165	NELAP	NH	04/05/2017
EPA 200.8	5.4	10014605	Vanadium	1185	NELAP	NH	04/05/2017

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320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 200.8	5.4	10014605	Zinc	1190	NELAP	NH	04/05/2017
EPA 245.1	3.0	10036609	Mercury	1095	NELAP	NH	04/05/2017
EPA 3005	A	10133207	Preconcentration under acid	1438	NELAP	NH	08/23/2017
EPA 3015	A	10134006	Microwave-assisted acid digestion	1430	NELAP	NH	04/05/2017
EPA 3510	C	10138202	Separatory funnel liquid-liquid extraction	1444	NELAP	NH	04/05/2017
EPA 3580	A	10143007	Waste dilution	1470	NELAP	NH	04/05/2017
EPA 3630	C	10146802	Silica gel cleanup	1446	NELAP	NH	04/05/2017
EPA 3640	A	10147203	Gel permeation cleanup (GPC)	1418	NELAP	NH	04/05/2017
EPA 3660	B	10148400	Sulfur cleanup	1456	NELAP	NH	04/05/2017
EPA 3665	A	10148808	Sulfuric acid/permanganate clean-up	1458	NELAP	NH	04/05/2017
EPA 522	1.0	10088570	1,4-Dioxane (1,4-Diethyleneoxide)	4735	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Aluminum	1000	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Antimony	1005	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Arsenic	1010	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Barium	1015	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Beryllium	1020	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Boron	1025	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Cadmium	1030	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Calcium	1035	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Chromium	1040	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Cobalt	1050	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Copper	1055	NELAP	NH	04/05/2017

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 6010	D	10155916	Iron	1070	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Lead	1075	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Lithium	1080	NELAP	NH	07/27/2023
EPA 6010	D	10155916	Magnesium	1085	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Manganese	1090	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Molybdenum	1100	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Nickel	1105	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Potassium	1125	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Selenium	1140	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Silica, as SiO2	1990	NELAP	NH	08/18/2020
EPA 6010	D	10155916	Silver	1150	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Sodium	1155	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Strontium	1160	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Sulfur	2017	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Thallium	1165	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Tin	1175	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Titanium	1180	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Vanadium	1185	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Zinc	1190	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Aluminum	1000	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Antimony	1005	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Arsenic	1010	NELAP	NH	04/05/2017

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 6020	B	10156420	Barium	1015	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Beryllium	1020	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Boron	1025	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Cadmium	1030	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Calcium	1035	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Chromium	1040	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Cobalt	1050	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Copper	1055	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Iron	1070	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Lead	1075	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Magnesium	1085	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Manganese	1090	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Molybdenum	1100	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Nickel	1105	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Potassium	1125	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Selenium	1140	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Silver	1150	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Sodium	1155	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Strontium	1160	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Thallium	1165	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Tin	1175	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Vanadium	1185	NELAP	NH	04/05/2017

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 6020	B	10156420	Zinc	1190	NELAP	NH	04/05/2017
EPA 7470	A	10165807	Mercury	1095	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Diesel-range organics (DRO)	9369	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Ethanol	4750	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Ethylene glycol	4785	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Isobutyl alcohol (2-Methyl-1-propanol)	4875	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Isopropyl alcohol (2-Propanol)	4895	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Methanol	4930	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Propylene glycol	6657	NELAP	NH	04/05/2017
EPA 8015	D	10305609	n-Propyl alcohol	5055	NELAP	NH	04/05/2017
EPA 8015	D	10305609	tert-Amyl alcohol (2-Methyl-2-butanol)	4368	NELAP	NH	04/05/2017
EPA 8015	D	10305609	tert-Butyl alcohol (2-Methyl-2-propanol)	4420	NELAP	NH	04/05/2017
EPA 8081	B	10178811	4,4'-DDD	7355	NELAP	NH	04/05/2017
EPA 8081	B	10178811	4,4'-DDE	7360	NELAP	NH	04/05/2017
EPA 8081	B	10178811	4,4'-DDT	7365	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Aldrin (HHDN)	7025	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Chlordane (tech.)	7250	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Dieldrin	7470	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endosulfan I	7510	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endosulfan II	7515	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endosulfan sulfate	7520	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endrin	7540	NELAP	NH	04/05/2017

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PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8081	B	10178811	Endrin aldehyde	7530	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endrin ketone	7535	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Heptachlor	7685	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Heptachlor epoxide	7690	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Hexachlorobenzene	6275	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Methoxychlor	7810	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Mirex	7870	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Toxaphene (Chlorinated camphene)	8250	NELAP	NH	04/05/2017
EPA 8081	B	10178811	alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NELAP	NH	04/05/2017
EPA 8081	B	10178811	alpha-Chlordane	7240	NELAP	NH	04/05/2017
EPA 8081	B	10178811	beta-BHC (beta-Hexachlorocyclohexane)	7115	NELAP	NH	04/05/2017
EPA 8081	B	10178811	delta-BHC (delta-Hexachlorocyclohexane)	7105	NELAP	NH	04/05/2017
EPA 8081	B	10178811	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NELAP	NH	04/05/2017
EPA 8081	B	10178811	gamma-Chlordane	7245	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1016 (PCB-1016)	8880	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1221 (PCB-1221)	8885	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1232 (PCB-1232)	8890	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1242 (PCB-1242)	8895	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1248 (PCB-1248)	8900	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1254 (PCB-1254)	8905	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1260 (PCB-1260)	8910	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1262 (PCB-1262)	8912	NELAP	NH	04/05/2017

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Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8082	A	10179201	Aroclor-1268 (PCB-1268)	8913	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,1'-Biphenyl (Biphenyl, Lemonene)	6703	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,2,3,5-Tetrachlorobenzene	6710	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,2,4,5-Tetrachlorobenzene	6715	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,2,4-Trichlorobenzene	5155	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,2-Diphenylhydrazine	6220	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl) ether)	4659	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,3,4,6-Tetrachlorophenol	6735	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4,5-Trichlorophenol	6835	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4,6-Trichlorophenol	6840	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4-Dichlorophenol	6000	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4-Dimethylphenol	6130	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4-Dinitrophenol	6175	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4-Dinitrotoluene (2,4-DNT)	6185	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,6-Dinitrotoluene (2,6-DNT)	6190	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Chloronaphthalene	5795	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Chlorophenol	5800	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NELAP	NH	04/05/2017

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 015-002 expiration date 08/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	2-Methylnaphthalene	6385	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Methylphenol (o-Cresol)	6400	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Nitroaniline	6460	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Nitrophenol	6490	NELAP	NH	04/05/2017
EPA 8270	E	10242543	3+4-Methylphenol (m+p-Cresol)	6412	NELAP	NH	04/05/2017
EPA 8270	E	10242543	3,3'-Dichlorobenzidine	5945	NELAP	NH	04/05/2017
EPA 8270	E	10242543	3-Nitroaniline	6465	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Bromophenyl phenyl ether	5660	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Chloro-3-methylphenol	5700	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Chloroaniline	5745	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Chlorophenyl phenyl ether	5825	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Nitroaniline	6470	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Nitrophenol	6500	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Acenaphthene	5500	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Acenaphthylene	5505	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Acetophenone	5510	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Aniline	5545	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Anthracene	5555	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Atrazine	7065	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzaldehyde	5570	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzidine	5595	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzo[a]anthracene	5575	NELAP	NH	04/05/2017

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	Benzo[a]pyrene	5580	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzo[b]fluoranthene	5585	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzo[ghi]perylene	5590	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzo[k]fluoranthene	5600	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzoic acid	5610	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzyl alcohol	5630	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzyl butyl phthalate (Butyl benzyl phthalate)	5670	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Caprolactam	7180	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Carbazole	5680	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Chrysene (Benzo[a]phenanthrene)	5855	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Di-n-butyl phthalate	5925	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Di-n-octyl phthalate	6200	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Dibenzo[a,h]anthracene	5895	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Dibenzofuran	5905	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Diethyl phthalate	6070	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Dimethyl phthalate	6135	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Fluoranthene	6265	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Fluorene	6270	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Hexachlorobenzene	6275	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Hexachlorocyclopentadiene	6285	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Hexachloroethane	4840	NELAP	NH	04/05/2017

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	Indeno(1,2,3-cd)pyrene	6315	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Isophorone	6320	NELAP	NH	04/05/2017
EPA 8270	E	10242543	N-Nitrosodi-n-propylamine	6545	NELAP	NH	04/05/2017
EPA 8270	E	10242543	N-Nitrosodimethylamine	6530	NELAP	NH	04/05/2017
EPA 8270	E	10242543	N-Nitrosodiphenylamine	6535	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Naphthalene	5005	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Nitrobenzene	5015	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Pentachloronitrobenzene (PCNB)	6600	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Pentachlorophenol (PCP)	6605	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Phenanthrene	6615	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Phenol	6625	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Pyrene	6665	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Pyridine	5095	NELAP	NH	04/05/2017
EPA 8270	E	10242543	bis(2-Chloroethoxy)methane	5760	NELAP	NH	04/05/2017
EPA 8270	E	10242543	bis(2-Chloroethyl) ether	5765	NELAP	NH	04/05/2017
EPA 8270	E	10242543	bis(2-Ethylhexyl) phthalate (DEHP)	6065	NELAP	NH	04/05/2017
EPA 8270 SIM	E	10242565	1,4-Dioxane (1,4-Diethyleneoxide)	4735	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	1-Methylnaphthalene	6380	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	2-Methylnaphthalene	6385	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Acenaphthene	5500	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Acenaphthylene	5505	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Anthracene	5555	NELAP	NH	08/18/2020

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270 SIM	E	10242565	Benzo[a]anthracene	5575	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[a]pyrene	5580	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[b]fluoranthene	5585	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[ghi]perylene	5590	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[k]fluoranthene	5600	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Chrysene (Benzo[a]phenanthrene)	5855	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Dibenzo[a,h]anthracene	5895	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Fluoranthene	6265	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Fluorene	6270	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Indeno(1,2,3-cd)pyrene	6315	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Naphthalene	5005	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Pentachlorophenol (PCP)	6605	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Phenanthrene	6615	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Pyrene	6665	NELAP	NH	08/18/2020
SOP (02089) 23528	17	60001174	Perfluorodecanesulfonic acid (PFDS)	6920	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorododecanesulfonic acid (PFDoS)	6923	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorononanesulfonic acid (PFNS)	6929	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoropentanesulfonic acid (PFPeS)	6934	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoropropanesulfonic acid (PFPrS)	9320	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	9490	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	1H, 1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2-FTS)	6948	NELAP	NH	11/07/2022

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
SOP (02089) 23528	17	60001174	1H, 1H, 2H, 2H-Perfluorododecane sulfonic acid (10:2-FTS)	9616	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	1H, 1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2-FTS)	6946	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	1H, 1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2-FTS)	6947	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	4,8-Dioxa-3H-perfluorononanoic acid (DONA)	6951	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	6952	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Hexafluoropropylene oxide dimer acid (HFPO-DA)	9460	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	N-Ethylperfluorooctanesulfonamide (EtFOSA)	9395	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	N-Methylperfluorooctanesulfonamide (MeFOSA)	9433	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	N-ethylperfluoro-1-octanesulfonamido ethanol (N-EtFOSE)	9431	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	N-methylperfluoro-1-octanesulfonamido ethanol (N-MeFOSE)	6949	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	6956	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	6957	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoro-3-methoxypropanoic acid (PFMPA)	6965	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoro-4-methoxybutanoic acid (PFMBA)	6966	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorobutanesulfonic acid (PFBS)	6918	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorobutanoic acid (PFBA)	6915	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorodecanoic acid (PFDA)	6905	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorododecanoic acid (PFDoA)	6903	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoroheptanesulfonic acid (PFHpS)	9470	NELAP	NH	11/07/2022

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
SOP (02089) 23528	17	60001174	Perfluoroheptanoic acid (PFHpA)	6908	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorohexadecanoic acid (PFHxDA)	6901	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorohexanesulfonic acid (PFHxS)	6927	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorohexanoic acid (PFHxA)	6913	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorononanoic acid (PFNA)	6906	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorooctadecanoic acid (PFODA)	6916	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorooctane sulfonamide (PFOSA)	6917	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorooctanesulfonic acid (PFOS)	6931	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorooctanoic acid (PFOA)	6912	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoropentanoic acid (PFPeA)	6914	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorotetradecanoic acid (PFTA)	6902	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorotridecanoic acid (PFTrDA)	9563	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoroundecanoic acid (PFUnA)	6904	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	n-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4846	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	n-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4847	NELAP	NH	11/07/2022

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date

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Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1633		10123463	Perfluorodecanesulfonic acid (PFDS)	6920	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorododecanesulfonic acid (PFDoS)	6923	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorononanesulfonic acid (PFNS)	6929	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoropentanesulfonic acid (PFPeS)	6934	NELAP	NH	09/19/2024
EPA 1633		10123463	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	9490	NELAP	NH	09/19/2024
EPA 1633		10123463	1H, 1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2-FTS)	6948	NELAP	NH	09/19/2024
EPA 1633		10123463	1H, 1H, 2H, 2H-Perfluorododecane sulfonic acid (10:2-FTS)	9616	NELAP	NH	09/19/2024
EPA 1633		10123463	1H, 1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2-FTS)	6946	NELAP	NH	09/19/2024
EPA 1633		10123463	1H, 1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2-FTS)	6947	NELAP	NH	09/19/2024
EPA 1633		10123463	2H,2H,3H,3H-Perfluorodecanoic acid (3-Perfluoroheptyl propanoic acid) (7:3 FTCA)	9340	NELAP	NH	09/19/2024
EPA 1633		10123463	2H,2H,3H,3H-Perfluorooctanoic acid (5:3 FTCA)	9338	NELAP	NH	09/19/2024
EPA 1633		10123463	4,4,5,5,6,6,6-Heptafluorohexanoic acid (3-Perfluoropropyl propanoic acid) (3:3 FTCA)	9353	NELAP	NH	09/19/2024
EPA 1633		10123463	4,8-Dioxa-3H-perfluorononanoic acid (DONA)	6951	NELAP	NH	09/19/2024
EPA 1633		10123463	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	6952	NELAP	NH	09/19/2024
EPA 1633		10123463	Hexafluoropropylene oxide dimer acid (HFPO-DA)	9460	NELAP	NH	09/19/2024
EPA 1633		10123463	N-Ethylperfluorooctanesulfonamide (EtFOSA)	9395	NELAP	NH	09/19/2024
EPA 1633		10123463	N-Methylperfluorooctanesulfonamide (MeFOSA)	9433	NELAP	NH	09/19/2024
EPA 1633		10123463	N-ethylperfluoro-1-octanesulfonamido ethanol (N-EtFOSE)	9431	NELAP	NH	09/19/2024

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1633		10123463	N-methylperfluoro-1-octanesulfonamido ethanol (N-MeFOSE)	6949	NELAP	NH	09/19/2024
EPA 1633		10123463	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	6956	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	6957	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoro-3-methoxypropanoic acid (PFMPA)	6965	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoro-4-methoxybutanoic acid (PFMBA)	6966	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorobutanesulfonic acid (PFBS)	6918	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorobutanoic acid (PFBA)	6915	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorodecanoic acid (PFDA)	6905	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorododecanoic acid (PFDoA)	6903	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoroheptanesulfonic acid (PFHpS)	9470	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoroheptanoic acid (PFHpA)	6908	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorohexanesulfonic acid (PFHxS)	6927	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorohexanoic acid (PFHxA)	6913	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorononanoic acid (PFNA)	6906	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorooctane sulfonamide (PFOSA)	6917	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorooctanesulfonic acid (PFOS)	6931	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorooctanoic acid (PFOA)	6912	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoropentanoic acid (PFPeA)	6914	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorotetradecanoic acid (PFTA)	6902	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluorotridecanoic acid (PFTrDA)	9563	NELAP	NH	09/19/2024
EPA 1633		10123463	Perfluoroundecanoic acid (PFUnA)	6904	NELAP	NH	09/19/2024

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1633		10123463	n-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4846	NELAP	NH	09/19/2024
EPA 1633		10123463	n-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4847	NELAP	NH	09/19/2024
EPA 1633 (draft)	2	10123430	Perfluorodecanesulfonic acid (PFDS)	6920	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorododecanesulfonic acid (PFDoS)	6923	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorononanesulfonic acid (PFNS)	6929	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoropentanesulfonic acid (PFPeS)	6934	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	9490	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	1H, 1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2-FTS)	6948	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	1H, 1H, 2H, 2H-Perfluorododecane sulfonic acid (10:2-FTS)	9616	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	1H, 1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2-FTS)	6946	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	1H, 1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2-FTS)	6947	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	2H,2H,3H,3H-Perfluorodecanoic acid (3-Perfluoroheptyl propanoic acid) (7:3 FTCA)	9340	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	2H,2H,3H,3H-Perfluorooctanoic acid (5:3 FTCA)	9338	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	4,4,5,5,6,6,6-Heptafluorohexanoic acid (3-Perfluoropropyl propanoic acid) (3:3 FTCA)	9353	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	4,8-Dioxa-3H-perfluorononanoic acid (DONA)	6951	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	6952	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Hexafluoropropylene oxide dimer acid (HFPO-DA)	9460	NELAP	NH	09/22/2023

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EPA 1633 (draft)	2	10123430	N-Ethylperfluorooctanesulfonamide (EtFOSA)	9395	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	N-Methylperfluorooctanesulfonamide (MeFOSA)	9433	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	N-ethylperfluoro-1-octanesulfonamido ethanol (N-EtFOSE)	9431	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	N-methylperfluoro-1-octanesulfonamido ethanol (N-MeFOSE)	6949	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	6956	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	6957	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoro-3-methoxypropanoic acid (PFMPA)	6965	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoro-4-methoxybutanoic acid (PFMBA)	6966	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorobutanesulfonic acid (PFBS)	6918	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorobutanoic acid (PFBA)	6915	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorodecanoic acid (PFDA)	6905	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorododecanoic acid (PFDoA)	6903	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoroheptanesulfonic acid (PFHpS)	9470	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoroheptanoic acid (PFHpA)	6908	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorohexanesulfonic acid (PFHxS)	6927	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorohexanoic acid (PFHxA)	6913	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorononanoic acid (PFNA)	6906	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorooctane sulfonamide (PFOSA)	6917	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorooctanesulfonic acid (PFOS)	6931	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorooctanoic acid (PFOA)	6912	NELAP	NH	09/22/2023

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PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1633 (draft)	2	10123430	Perfluoropentanoic acid (PFPeA)	6914	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorotetradecanoic acid (PFTA)	6902	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluorotridecanoic acid (PFTrDA)	9563	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	Perfluoroundecanoic acid (PFUnA)	6904	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	n-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4846	NELAP	NH	09/22/2023
EPA 1633 (draft)	2	10123430	n-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4847	NELAP	NH	09/22/2023
EPA 3050	B	10135601	Acid digestion of solids	1400	NELAP	NH	04/05/2017
EPA 3051	A	10136002	Microwave digestion of solids (HNO3 + HCl)	1433	NELAP	NH	04/05/2017
EPA 3570		10142708	Microscale solvent extraction (MSE)	1429	NELAP	NH	04/05/2017
EPA 3580	A	10143007	Waste dilution	1470	NELAP	NH	04/05/2017
EPA 3630	C	10146802	Silica gel cleanup	1446	NELAP	NH	04/05/2017
EPA 3640	A	10147203	Gel permeation cleanup (GPC)	1418	NELAP	NH	04/05/2017
EPA 3660	B	10148400	Sulfur cleanup	1456	NELAP	NH	04/05/2017
EPA 3665	A	10148808	Sulfuric acid/permanganate clean-up	1458	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Aluminum	1000	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Antimony	1005	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Arsenic	1010	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Barium	1015	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Beryllium	1020	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Boron	1025	NELAP	NH	04/05/2017

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(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 6010	D	10155916	Cadmium	1030	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Calcium	1035	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Chromium	1040	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Cobalt	1050	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Copper	1055	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Iron	1070	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Lead	1075	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Lithium	1080	NELAP	NH	11/03/2023
EPA 6010	D	10155916	Magnesium	1085	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Manganese	1090	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Molybdenum	1100	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Nickel	1105	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Potassium	1125	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Selenium	1140	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Silver	1150	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Sodium	1155	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Strontium	1160	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Sulfur	2017	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Thallium	1165	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Tin	1175	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Titanium	1180	NELAP	NH	04/05/2017
EPA 6010	D	10155916	Vanadium	1185	NELAP	NH	04/05/2017

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Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 6010	D	10155916	Zinc	1190	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Aluminum	1000	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Antimony	1005	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Arsenic	1010	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Barium	1015	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Beryllium	1020	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Cadmium	1030	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Calcium	1035	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Chromium	1040	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Cobalt	1050	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Copper	1055	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Iron	1070	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Lead	1075	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Magnesium	1085	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Manganese	1090	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Molybdenum	1100	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Nickel	1105	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Potassium	1125	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Selenium	1140	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Silver	1150	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Sodium	1155	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Strontium	1160	NELAP	NH	04/05/2017

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DEP Laboratory ID: 68-02089
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PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 6020	B	10156420	Thallium	1165	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Tin	1175	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Vanadium	1185	NELAP	NH	04/05/2017
EPA 6020	B	10156420	Zinc	1190	NELAP	NH	04/05/2017
EPA 7471	B	10166457	Mercury	1095	NELAP	NH	04/05/2017
EPA 7474		10167007	Mercury	1095	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Diesel-range organics (DRO)	9369	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Ethanol	4750	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Ethylene glycol	4785	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Isobutyl alcohol (2-Methyl-1-propanol)	4875	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Isopropyl alcohol (2-Propanol)	4895	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Methanol	4930	NELAP	NH	04/05/2017
EPA 8015	D	10305609	Propylene glycol	6657	NELAP	NH	04/05/2017
EPA 8015	D	10305609	n-Propyl alcohol	5055	NELAP	NH	04/05/2017
EPA 8015	D	10305609	tert-Amyl alcohol (2-Methyl-2-butanol)	4368	NELAP	NH	04/05/2017
EPA 8015	D	10305609	tert-Butyl alcohol (2-Methyl-2-propanol)	4420	NELAP	NH	04/05/2017
EPA 8081	B	10178811	4,4'-DDD	7355	NELAP	NH	04/05/2017
EPA 8081	B	10178811	4,4'-DDE	7360	NELAP	NH	04/05/2017
EPA 8081	B	10178811	4,4'-DDT	7365	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Aldrin (HHDN)	7025	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Chlordane (tech.)	7250	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Dieldrin	7470	NELAP	NH	04/05/2017

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Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8081	B	10178811	Endosulfan I	7510	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endosulfan II	7515	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endosulfan sulfate	7520	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endrin	7540	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endrin aldehyde	7530	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Endrin ketone	7535	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Heptachlor	7685	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Heptachlor epoxide	7690	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Hexachlorobenzene	6275	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Methoxychlor	7810	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Mirex	7870	NELAP	NH	04/05/2017
EPA 8081	B	10178811	Toxaphene (Chlorinated camphene)	8250	NELAP	NH	04/05/2017
EPA 8081	B	10178811	alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NELAP	NH	04/05/2017
EPA 8081	B	10178811	alpha-Chlordane	7240	NELAP	NH	04/05/2017
EPA 8081	B	10178811	beta-BHC (beta-Hexachlorocyclohexane)	7115	NELAP	NH	04/05/2017
EPA 8081	B	10178811	delta-BHC (delta-Hexachlorocyclohexane)	7105	NELAP	NH	04/05/2017
EPA 8081	B	10178811	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NELAP	NH	04/05/2017
EPA 8081	B	10178811	gamma-Chlordane	7245	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1016 (PCB-1016)	8880	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1221 (PCB-1221)	8885	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1232 (PCB-1232)	8890	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1242 (PCB-1242)	8895	NELAP	NH	04/05/2017

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EPA 8082	A	10179201	Aroclor-1248 (PCB-1248)	8900	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1254 (PCB-1254)	8905	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1260 (PCB-1260)	8910	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1262 (PCB-1262)	8912	NELAP	NH	04/05/2017
EPA 8082	A	10179201	Aroclor-1268 (PCB-1268)	8913	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,1'-Biphenyl (Biphenyl, Lemonene)	6703	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,2,4,5-Tetrachlorobenzene	6715	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,2,4-Trichlorobenzene	5155	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,2-Diphenylhydrazine	6220	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NELAP	NH	04/05/2017
EPA 8270	E	10242543	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl) ether)	4659	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,3,4,6-Tetrachlorophenol	6735	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4,5-Trichlorophenol	6835	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4,6-Trichlorophenol	6840	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4-Dichlorophenol	6000	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4-Dimethylphenol	6130	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4-Dinitrophenol	6175	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,4-Dinitrotoluene (2,4-DNT)	6185	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2,6-Dinitrotoluene (2,6-DNT)	6190	NELAP	NH	04/05/2017

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 015-002 expiration date 08/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	2-Chloronaphthalene	5795	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Chlorophenol	5800	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Methylnaphthalene	6385	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Methylphenol (o-Cresol)	6400	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Nitroaniline	6460	NELAP	NH	04/05/2017
EPA 8270	E	10242543	2-Nitrophenol	6490	NELAP	NH	04/05/2017
EPA 8270	E	10242543	3+4-Methylphenol (m+p-Cresol)	6412	NELAP	NH	04/05/2017
EPA 8270	E	10242543	3,3'-Dichlorobenzidine	5945	NELAP	NH	04/05/2017
EPA 8270	E	10242543	3-Nitroaniline	6465	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Bromophenyl phenyl ether	5660	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Chloro-3-methylphenol	5700	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Chloroaniline	5745	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Chlorophenyl phenyl ether	5825	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Nitroaniline	6470	NELAP	NH	04/05/2017
EPA 8270	E	10242543	4-Nitrophenol	6500	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Acenaphthene	5500	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Acenaphthylene	5505	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Acetophenone	5510	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Aniline	5545	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Anthracene	5555	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzaldehyde	5570	NELAP	NH	04/05/2017

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	Benzidine	5595	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzo[a]anthracene	5575	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzo[a]pyrene	5580	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzo[b]fluoranthene	5585	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzo[ghi]perylene	5590	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzo[k]fluoranthene	5600	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzoic acid	5610	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzyl alcohol	5630	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Benzyl butyl phthalate (Butyl benzyl phthalate)	5670	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Caprolactam	7180	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Carbazole	5680	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Chrysene (Benzo[a]phenanthrene)	5855	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Di-n-butyl phthalate	5925	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Di-n-octyl phthalate	6200	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Dibenzo[a,h]anthracene	5895	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Dibenzofuran	5905	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Diethyl phthalate	6070	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Dimethyl phthalate	6135	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Fluoranthene	6265	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Fluorene	6270	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Hexachlorobenzene	6275	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	04/05/2017

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 015-002 expiration date 08/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	Hexachlorocyclopentadiene	6285	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Hexachloroethane	4840	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Indeno(1,2,3-cd)pyrene	6315	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Isophorone	6320	NELAP	NH	04/05/2017
EPA 8270	E	10242543	N-Nitrosodi-n-propylamine	6545	NELAP	NH	04/05/2017
EPA 8270	E	10242543	N-Nitrosodimethylamine	6530	NELAP	NH	04/05/2017
EPA 8270	E	10242543	N-Nitrosodiphenylamine	6535	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Naphthalene	5005	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Nitrobenzene	5015	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Pentachloronitrobenzene (PCNB)	6600	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Pentachlorophenol (PCP)	6605	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Phenanthrene	6615	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Phenol	6625	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Pyrene	6665	NELAP	NH	04/05/2017
EPA 8270	E	10242543	Pyridine	5095	NELAP	NH	04/05/2017
EPA 8270	E	10242543	bis(2-Chloroethoxy)methane	5760	NELAP	NH	04/05/2017
EPA 8270	E	10242543	bis(2-Chloroethyl) ether	5765	NELAP	NH	04/05/2017
EPA 8270	E	10242543	bis(2-Ethylhexyl) phthalate (DEHP)	6065	NELAP	NH	04/05/2017
EPA 8270 SIM	E	10242565	1,4-Dioxane (1,4-Diethyleneoxide)	4735	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	1-Methylnaphthalene	6380	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	2-Methylnaphthalene	6385	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Acenaphthene	5500	NELAP	NH	08/18/2020

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 015-002 expiration date 08/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270 SIM	E	10242565	Acenaphthylene	5505	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Anthracene	5555	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[a]anthracene	5575	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[a]pyrene	5580	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[b]fluoranthene	5585	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[ghi]perylene	5590	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[k]fluoranthene	5600	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Chrysene (Benzo[a]phenanthrene)	5855	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Dibenzo[a,h]anthracene	5895	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Fluoranthene	6265	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Fluorene	6270	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Indeno(1,2,3-cd)pyrene	6315	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Naphthalene	5005	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Pentachlorophenol (PCP)	6605	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Phenanthrene	6615	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Pyrene	6665	NELAP	NH	08/18/2020
EPA 9060	A	10244823	Total organic carbon (TOC)	2040	NELAP	NH	04/05/2017
EPA Lloyd Kahn Method		60041001	Total organic carbon (TOC)	2040	NELAP	NH	04/05/2017
SM 2540G - 1991	18th ed.	20005203	Residue, total	1950	NELAP	NH	04/05/2017
SOP (02089) 23528	17	60001174	Perfluorodecanesulfonic acid (PFDS)	6920	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorododecanesulfonic acid (PFDoS)	6923	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorononanesulfonic acid (PFNS)	6929	NELAP	NH	11/07/2022

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Mansfield MA (320 Forbes)
320 Forbes Boulevard
Mansfield, MA 02048
(508) 898-9220

DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
SOP (02089) 23528	17	60001174	Perfluoropentanesulfonic acid (PFPeS)	6934	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoropropanesulfonic acid (PFPrS)	9320	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	9490	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	1H, 1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2-FTS)	6948	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	1H, 1H, 2H, 2H-Perfluorododecane sulfonic acid (10:2-FTS)	9616	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	1H, 1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2-FTS)	6946	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	1H, 1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2-FTS)	6947	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	4,8-Dioxa-3H-perfluorononanoic acid (DONA)	6951	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	6952	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Hexafluoropropylene oxide dimer acid (HFPO-DA)	9460	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	N-Ethylperfluorooctanesulfonamide (EtFOSA)	9395	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	N-Methylperfluorooctanesulfonamide (MeFOSA)	9433	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	N-ethylperfluoro-1-octanesulfonamido ethanol (N-EtFOSE)	9431	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	N-methylperfluoro-1-octanesulfonamido ethanol (N-MeFOSE)	6949	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	6956	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	6957	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoro-3-methoxypropanoic acid (PFMPA)	6965	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoro-4-methoxybutanoic acid (PFMBA)	6966	NELAP	NH	11/07/2022

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DEP Laboratory ID: 68-02089
EPA Lab Code: MA00030
TNI Code: TNI00262
PADWIS ID: 68089

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
SOP (02089) 23528	17	60001174	Perfluorobutanesulfonic acid (PFBS)	6918	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorobutanoic acid (PFBA)	6915	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorodecanoic acid (PFDA)	6905	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorododecanoic acid (PFDoA)	6903	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoroheptanesulfonic acid (PFHpS)	9470	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoroheptanoic acid (PFHpA)	6908	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorohexadecanoic acid (PFHxDA)	6901	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorohexanesulfonic acid (PFHxS)	6927	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorohexanoic acid (PFHxA)	6913	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorononanoic acid (PFNA)	6906	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorooctadecanoic acid (PFODA)	6916	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorooctane sulfonamide (PFOSA)	6917	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorooctanesulfonic acid (PFOS)	6931	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorooctanoic acid (PFOA)	6912	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoropentanoic acid (PFPeA)	6914	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorotetradecanoic acid (PFTA)	6902	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluorotridecanoic acid (PFTrDA)	9563	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	Perfluoroundecanoic acid (PFUnA)	6904	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	n-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	4846	NELAP	NH	11/07/2022
SOP (02089) 23528	17	60001174	n-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	4847	NELAP	NH	11/07/2022

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF LABORATORIES

LABORATORY ACCREDITATION PROGRAM

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certifies That

68-03671

Pace Analytical Services LLC - Westborough, MA

8 Walkup Drive, Westborough, MA, 01581

Having duly met the requirement of
The act of June 29, 2002 (P.L. 596, No. 90)
dealing with Environmental Laboratories Accreditation
(27 Pa. C.S. 4104-4113) and the
National Environmental Laboratory Accreditation Program Standard
is hereby approved as an

Accredited Laboratory

to conduct analysis within the fields of accreditations more fully described in the attached Scope of Accreditation

NELAP accreditation granted by the PA DEP to an environmental laboratory is conditioned upon continued compliance with the current edition of the NELAC Standard or TNI Standard and the following Subchapters and Sections of 25 Pa. Code Chapter 252: Subchapter A (relating to general provisions); Subchapter B (relating to application, fees and supporting documents); Subchapter E (relating to proficiency test study requirements); Subchapter F (relating to assessment requirements); Subchapter G (relating to miscellaneous provisions); Section 252.307; and Section 252.401.

Expiration Date: **12/31/2025**

Certificate Number: **018**

Annmarie Beach

Annmarie Beach, Chief
Laboratory Accreditation Program
Bureau of Laboratories

Continued accreditation status depends on successful ongoing participation in the program
Certificate not transferable Surrender upon revocation
To be conspicuously displayed at the Laboratory
Not valid unless accompanied by a valid Scope of Accreditation
Shall not be used to imply endorsement by the Commonwealth of Pennsylvania
Customers are urged to verify the laboratory's current accreditation status
PA DEP is a NELAP recognized accreditation body

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 018-002 expiration date 12/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 180.1	2	10011800	Turbidity	2055	NELAP	NH	06/19/2017
EPA 300.0	2.1	10053200	Chloride	1575	NELAP	NH	06/19/2017
EPA 300.0	2.1	10053200	Fluoride	1730	NELAP	NH	06/19/2017
EPA 300.0	2.1	10053200	Nitrate as N	1810	NELAP	NH	09/15/2017
EPA 300.0	2.1	10053200	Sulfate	2000	NELAP	NH	06/19/2017
EPA 353.2	2.0	10067604	Nitrate as N	1810	NELAP	NH	09/15/2017
EPA 353.2	2.0	10067604	Nitrite as N	1840	NELAP	NH	09/15/2017
EPA 504.1	1.1	10082801	1,2,3-Trichloropropane (1,2,3-TCP)	5180	NELAP	NH	06/17/2019
EPA 504.1	1.1	10082801	1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	4570	NELAP	NH	06/19/2017
EPA 504.1	1.1	10082801	1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,1,1,2-Tetrachloroethane	5105	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,1,1-Trichloroethane	5160	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,1,2,2-Tetrachloroethane	5110	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,1,2-Trichloroethane	5165	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,1-Dichloroethane	4630	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,1-Dichloroethene (1,1-Dichloroethylene)	4640	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,1-Dichloropropene	4670	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,2,3-Trichlorobenzene	5150	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,2,3-Trichloropropane (1,2,3-TCP)	5180	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,2,4-Trichlorobenzene	5155	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,2,4-Trimethylbenzene	5210	NELAP	NH	06/19/2017

Annmarie Beach

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 018-002 expiration date 12/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 524.2	4.1	10088809	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,2-Dichloroethane	4635	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,2-Dichloropropane	4655	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,3,5-Trichlorobenzene	6800	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,3,5-Trimethylbenzene	5215	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,3-Dichloropropane	4660	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	2,2-Dichloropropane	4665	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	2-Butanone (Methyl ethyl ketone, MEK)	4410	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	2-Chlorotoluene	4535	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	2-Hexanone	4860	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	4-Chlorotoluene	4540	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	4-Methyl-2-pentanone (MIBK)	4995	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Acetone	4315	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Benzene	4375	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Bromobenzene	4385	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Bromochloromethane	4390	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Bromodichloromethane	4395	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Bromoform	4400	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Carbon disulfide	4450	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Carbon tetrachloride	4455	NELAP	NH	06/19/2017

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 524.2	4.1	10088809	Chlorobenzene	4475	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Chloroethane	4485	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Chloroform	4505	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Dibromochloromethane	4575	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Dibromomethane	4595	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Dichlorodifluoromethane (Freon 12)	4625	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Diethyl ether (Ethyl ether)	4725	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Diisopropyl ether (DIPE)	9375	NELAP	NH	12/19/2017
EPA 524.2	4.1	10088809	Ethyl tert-butyl ether (ETBE)	4770	NELAP	NH	12/19/2017
EPA 524.2	4.1	10088809	Ethylbenzene	4765	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Isopropylbenzene (Cumene)	4900	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Methyl bromide (Bromomethane)	4950	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Methyl chloride (Chloromethane)	4960	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Methyl tert-butyl ether (MTBE)	5000	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Methylene chloride (Dichloromethane)	4975	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Naphthalene	5005	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Styrene	5100	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Tetrachloroethene (PCE, Perchloroethylene)	5115	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Tetrahydrofuran (THF)	5120	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Toluene	5140	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Total trihalomethanes (TTHMs)	5205	NELAP	NH	06/19/2017

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Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 524.2	4.1	10088809	Trichloroethene (TCE, Trichloroethylene)	5170	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Trichlorofluoromethane (Freon 11)	5175	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Vinyl chloride (Chloroethene)	5235	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	Xylenes, total	5260	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	cis-1,2-Dichloroethene	4645	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	cis-1,3-Dichloropropene	4680	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	m+p-Xylene	5240	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	n-Butylbenzene	4435	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	n-Propylbenzene	5090	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	o-Xylene	5250	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	p-Isopropyltoluene (4-Isopropyltoluene)	4910	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	sec-Butylbenzene	4440	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	tert-Amyl methyl ether (TAME)	4370	NELAP	NH	12/19/2017
EPA 524.2	4.1	10088809	tert-Butyl alcohol (2-Methyl-2-propanol)	4420	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	tert-Butylbenzene	4445	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	trans-1,2-Dichloroethene	4700	NELAP	NH	06/19/2017
EPA 524.2	4.1	10088809	trans-1,3-Dichloropropene	4685	NELAP	NH	06/19/2017
SM 2120B - 2011	22nd ed.	20039014	Color	1605	NELAP	NH	06/19/2017
SM 2130B - 2011	22nd ed.	20042619	Turbidity	2055	NELAP	NH	06/19/2017
SM 2150B - 2011	Online ed.	20043816	Odor	1855	NELAP	NH	06/19/2017
SM 2320B - 2011	Online ed.	20045618	Alkalinity as CaCO3	1505	NELAP	NH	06/19/2017
SM 2510B - 2011	Online ed.	20048617	Conductivity	1610	NELAP	NH	06/19/2017

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Drinking Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
SM 2540C - 2011	Online ed.	20050413	Residue, filterable (TDS)	1955	NELAP	NH	06/19/2017
SM 4500-CN- C - 2011	Online ed.	20065663	Cyanide distillation	1412	NELAP	NH	06/19/2017
SM 4500-CN- E - 2011	22nd ed.	20096213	Total cyanide	1645	NELAP	NH	06/19/2017
SM 4500-F- C - 2011	22nd ed.	20102210	Fluoride	1730	NELAP	NH	06/19/2017
SM 4500-H + B - 2011	Online ed.	20105220	pH	1900	NELAP	NH	06/19/2017
SM 4500-NO2- B - 2011	Online ed.	20113115	Nitrite as N	1840	NELAP	NH	12/17/2019
SM 4500-NO3- F - 2011	22nd ed.	20116410	Nitrate as N	1810	NELAP	NH	06/19/2017
SM 4500-NO3- F - 2011	22nd ed.	20116410	Nitrite as N	1840	NELAP	NH	06/19/2017
SM 4500-NO3- F - 2011	22nd ed.	20116410	Total nitrate-nitrite	1820	NELAP	NH	06/19/2017
SM 4500-P E - 2011	Online ed.	20124225	Orthophosphate as P	1870	NELAP	NH	09/15/2017
SM 5310C - 2011	22nd ed.	20138618	Dissolved organic carbon (DOC)	1710	NELAP	NH	09/15/2017
SM 5310C - 2011	22nd ed.	20138618	Total organic carbon (TOC)	2040	NELAP	NH	09/15/2017

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 1010	A	10234807	Ignitability	1780	NELAP	NH	06/19/2017
EPA 120.1		10006403	Conductivity	1610	NELAP	NH	06/19/2017
EPA 1664	B	10261617	Non-polar material	1853	NELAP	NH	07/17/2018
EPA 1664	B	10261617	Oil and grease	1803	NELAP	NH	09/15/2017
EPA 180.1	2	10011800	Turbidity	2055	NELAP	NH	06/19/2017

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(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 300.0	2.1	10053200	Bromide	1540	NELAP	NH	06/19/2017
EPA 300.0	2.1	10053200	Chloride	1575	NELAP	NH	06/19/2017
EPA 300.0	2.1	10053200	Fluoride	1730	NELAP	NH	06/19/2017
EPA 300.0	2.1	10053200	Nitrate as N	1810	NELAP	NH	06/19/2017
EPA 300.0	2.1	10053200	Sulfate	2000	NELAP	NH	06/19/2017
EPA 3060	A	10136604	Alkaline digestion of Cr(VI)	1402	NELAP	NH	06/19/2017
EPA 350.1	2.0	10063602	Ammonia as N	1515	NELAP	NH	06/19/2017
EPA 351.1		10064809	Kjeldahl nitrogen, total (TKN)	1795	NELAP	NH	06/19/2017
EPA 3510	C	10138202	Separatory funnel liquid-liquid extraction	1444	NELAP	NH	06/19/2017
EPA 3511		10279819	Organic compounds in water by microextraction	7538	NELAP	NH	09/09/2024
EPA 353.2	2.0	10067604	Nitrate as N	1810	NELAP	NH	09/15/2017
EPA 353.2	2.0	10067604	Nitrite as N	1840	NELAP	NH	06/19/2017
EPA 353.2	2.0	10067604	Total nitrate-nitrite	1820	NELAP	NH	06/19/2017
EPA 3630	C	10146802	Silica gel cleanup	1446	NELAP	NH	06/19/2017
EPA 3665	A	10148808	Sulfuric acid/permanganate clean-up	1458	NELAP	NH	06/19/2017
EPA 410.4	2.0	10077404	Chemical oxygen demand (COD)	1565	NELAP	NH	06/19/2017
EPA 420.1		10079400	Total phenolics	1905	NELAP	NH	06/19/2017
EPA 5030	C	10284603	Aqueous-phase purge-and-trap	1406	NELAP	NH	06/19/2017
EPA 608.3		10296614	4,4'-DDD	7355	NELAP	NH	07/17/2018
EPA 608.3		10296614	4,4'-DDE	7360	NELAP	NH	07/17/2018
EPA 608.3		10296614	4,4'-DDT	7365	NELAP	NH	07/17/2018
EPA 608.3		10296614	Aldrin (HHDN)	7025	NELAP	NH	07/17/2018

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8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 608.3		10296614	Aroclor-1016 (PCB-1016)	8880	NELAP	NH	07/17/2018
EPA 608.3		10296614	Aroclor-1221 (PCB-1221)	8885	NELAP	NH	07/17/2018
EPA 608.3		10296614	Aroclor-1232 (PCB-1232)	8890	NELAP	NH	07/17/2018
EPA 608.3		10296614	Aroclor-1242 (PCB-1242)	8895	NELAP	NH	07/17/2018
EPA 608.3		10296614	Aroclor-1248 (PCB-1248)	8900	NELAP	NH	07/17/2018
EPA 608.3		10296614	Aroclor-1254 (PCB-1254)	8905	NELAP	NH	07/17/2018
EPA 608.3		10296614	Aroclor-1260 (PCB-1260)	8910	NELAP	NH	07/17/2018
EPA 608.3		10296614	Chlordane (tech.)	7250	NELAP	NH	07/17/2018
EPA 608.3		10296614	Dieldrin	7470	NELAP	NH	07/17/2018
EPA 608.3		10296614	Endosulfan I	7510	NELAP	NH	07/17/2018
EPA 608.3		10296614	Endosulfan II	7515	NELAP	NH	07/17/2018
EPA 608.3		10296614	Endosulfan sulfate	7520	NELAP	NH	07/17/2018
EPA 608.3		10296614	Endrin	7540	NELAP	NH	07/17/2018
EPA 608.3		10296614	Endrin aldehyde	7530	NELAP	NH	07/17/2018
EPA 608.3		10296614	Endrin ketone	7535	NELAP	NH	07/17/2018
EPA 608.3		10296614	Heptachlor	7685	NELAP	NH	07/17/2018
EPA 608.3		10296614	Heptachlor epoxide	7690	NELAP	NH	07/17/2018
EPA 608.3		10296614	Methoxychlor	7810	NELAP	NH	07/17/2018
EPA 608.3		10296614	Mirex	7870	NELAP	NH	06/17/2019
EPA 608.3		10296614	Toxaphene (Chlorinated camphene)	8250	NELAP	NH	07/17/2018
EPA 608.3		10296614	alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NELAP	NH	07/17/2018
EPA 608.3		10296614	alpha-Chlordane	7240	NELAP	NH	07/17/2018

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8 Walkup Drive
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DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 608.3		10296614	beta-BHC (beta-Hexachlorocyclohexane)	7115	NELAP	NH	07/17/2018
EPA 608.3		10296614	delta-BHC (delta-Hexachlorocyclohexane)	7105	NELAP	NH	07/17/2018
EPA 608.3		10296614	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NELAP	NH	07/17/2018
EPA 608.3		10296614	gamma-Chlordane	7245	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,1,1-Trichloroethane	5160	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,1,2,2-Tetrachloroethane	5110	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	5185	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,1,2-Trichloroethane	5165	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,1-Dichloroethane	4630	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,1-Dichloroethene (1,1-Dichloroethylene)	4640	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,2,3-Trichlorobenzene	5150	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,2,4-Trichlorobenzene	5155	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	4570	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	NELAP	NH	12/20/2018
EPA 624.1		10298121	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,2-Dichloroethane	4635	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,2-Dichloropropane	4655	NELAP	NH	08/01/2018
EPA 624.1		10298121	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,3-Dichloropropane	4660	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NELAP	NH	07/17/2018
EPA 624.1		10298121	1,4-Dioxane (1,4-Diethyleneoxide)	4735	NELAP	NH	07/17/2018

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TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 624.1		10298121	2-Butanone (Methyl ethyl ketone, MEK)	4410	NELAP	NH	07/17/2018
EPA 624.1		10298121	2-Chloroethyl vinyl ether	4500	NELAP	NH	07/17/2018
EPA 624.1		10298121	2-Hexanone	4860	NELAP	NH	07/17/2018
EPA 624.1		10298121	4-Methyl-2-pentanone (MIBK)	4995	NELAP	NH	07/17/2018
EPA 624.1		10298121	Acetone	4315	NELAP	NH	07/17/2018
EPA 624.1		10298121	Acrolein (Propenal)	4325	NELAP	NH	07/17/2018
EPA 624.1		10298121	Acrylonitrile	4340	NELAP	NH	07/17/2018
EPA 624.1		10298121	Benzene	4375	NELAP	NH	07/17/2018
EPA 624.1		10298121	Bromodichloromethane	4395	NELAP	NH	07/17/2018
EPA 624.1		10298121	Bromoform	4400	NELAP	NH	07/17/2018
EPA 624.1		10298121	Carbon disulfide	4450	NELAP	NH	07/17/2018
EPA 624.1		10298121	Carbon tetrachloride	4455	NELAP	NH	07/17/2018
EPA 624.1		10298121	Chlorobenzene	4475	NELAP	NH	07/17/2018
EPA 624.1		10298121	Chloroethane	4485	NELAP	NH	07/17/2018
EPA 624.1		10298121	Chloroform	4505	NELAP	NH	07/17/2018
EPA 624.1		10298121	Dibromochloromethane	4575	NELAP	NH	07/17/2018
EPA 624.1		10298121	Dibromomethane	4595	NELAP	NH	07/17/2018
EPA 624.1		10298121	Dichlorodifluoromethane (Freon 12)	4625	NELAP	NH	07/17/2018
EPA 624.1		10298121	Ethanol	4750	NELAP	NH	12/06/2021
EPA 624.1		10298121	Ethylbenzene	4765	NELAP	NH	07/17/2018
EPA 624.1		10298121	Isopropylbenzene (Cumene)	4900	NELAP	NH	07/17/2018
EPA 624.1		10298121	Methyl bromide (Bromomethane)	4950	NELAP	NH	07/17/2018

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 018-002 expiration date 12/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 624.1		10298121	Methyl chloride (Chloromethane)	4960	NELAP	NH	07/17/2018
EPA 624.1		10298121	Methyl tert-butyl ether (MTBE)	5000	NELAP	NH	07/17/2018
EPA 624.1		10298121	Methylcyclohexane	4965	NELAP	NH	07/17/2018
EPA 624.1		10298121	Methylene chloride (Dichloromethane)	4975	NELAP	NH	07/17/2018
EPA 624.1		10298121	Styrene	5100	NELAP	NH	07/17/2018
EPA 624.1		10298121	Tetrachloroethene (PCE, Perchloroethylene)	5115	NELAP	NH	07/17/2018
EPA 624.1		10298121	Toluene	5140	NELAP	NH	07/17/2018
EPA 624.1		10298121	Trichloroethene (TCE, Trichloroethylene)	5170	NELAP	NH	07/17/2018
EPA 624.1		10298121	Trichlorofluoromethane (Freon 11)	5175	NELAP	NH	07/17/2018
EPA 624.1		10298121	Vinyl acetate	5225	NELAP	NH	07/17/2018
EPA 624.1		10298121	Vinyl chloride (Chloroethene)	5235	NELAP	NH	07/17/2018
EPA 624.1		10298121	Xylenes, total	5260	NELAP	NH	07/17/2018
EPA 624.1		10298121	cis-1,2-Dichloroethene	4645	NELAP	NH	07/17/2018
EPA 624.1		10298121	cis-1,3-Dichloropropene	4680	NELAP	NH	07/17/2018
EPA 624.1		10298121	n-Hexane	4855	NELAP	NH	07/17/2018
EPA 624.1		10298121	tert-Amyl methyl ether (TAME)	4370	NELAP	NH	07/17/2018
EPA 624.1		10298121	tert-Butyl alcohol (2-Methyl-2-propanol)	4420	NELAP	NH	07/17/2018
EPA 624.1		10298121	trans-1,2-Dichloroethene	4700	NELAP	NH	07/17/2018
EPA 624.1		10298121	trans-1,3-Dichloropropene	4685	NELAP	NH	07/17/2018
EPA 625.1		10300024	1,2,4-Trichlorobenzene	5155	NELAP	NH	07/17/2018
EPA 625.1		10300024	1,2-Diphenylhydrazine	6220	NELAP	NH	07/17/2018
EPA 625.1		10300024	1-Methylnaphthalene	6380	NELAP	NH	12/17/2019

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 625.1		10300024	2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl) ether)	4659	NELAP	NH	07/17/2018
EPA 625.1		10300024	2,3,4,6-Tetrachlorophenol	6735	NELAP	NH	07/17/2018
EPA 625.1		10300024	2,4,5-Trichlorophenol	6835	NELAP	NH	07/17/2018
EPA 625.1		10300024	2,4,6-Trichlorophenol	6840	NELAP	NH	07/17/2018
EPA 625.1		10300024	2,4-Dichlorophenol	6000	NELAP	NH	07/17/2018
EPA 625.1		10300024	2,4-Dimethylphenol	6130	NELAP	NH	07/17/2018
EPA 625.1		10300024	2,4-Dinitrophenol	6175	NELAP	NH	07/17/2018
EPA 625.1		10300024	2,4-Dinitrotoluene (2,4-DNT)	6185	NELAP	NH	07/17/2018
EPA 625.1		10300024	2,6-Dinitrotoluene (2,6-DNT)	6190	NELAP	NH	07/17/2018
EPA 625.1		10300024	2-Chloronaphthalene	5795	NELAP	NH	07/17/2018
EPA 625.1		10300024	2-Chlorophenol	5800	NELAP	NH	07/17/2018
EPA 625.1		10300024	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NELAP	NH	07/17/2018
EPA 625.1		10300024	2-Methylnaphthalene	6385	NELAP	NH	07/17/2018
EPA 625.1		10300024	2-Methylphenol (o-Cresol)	6400	NELAP	NH	07/17/2018
EPA 625.1		10300024	2-Nitroaniline	6460	NELAP	NH	07/17/2018
EPA 625.1		10300024	2-Nitrophenol	6490	NELAP	NH	07/17/2018
EPA 625.1		10300024	3+4-Methylphenol (m+p-Cresol)	6412	NELAP	NH	07/17/2018
EPA 625.1		10300024	3,3'-Dichlorobenzidine	5945	NELAP	NH	07/17/2018
EPA 625.1		10300024	3-Nitroaniline	6465	NELAP	NH	07/17/2018
EPA 625.1		10300024	4-Bromophenyl phenyl ether	5660	NELAP	NH	07/17/2018
EPA 625.1		10300024	4-Chloro-3-methylphenol	5700	NELAP	NH	07/17/2018

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 625.1		10300024	4-Chloroaniline	5745	NELAP	NH	07/17/2018
EPA 625.1		10300024	4-Chlorophenyl phenyl ether	5825	NELAP	NH	07/17/2018
EPA 625.1		10300024	4-Nitroaniline	6470	NELAP	NH	07/17/2018
EPA 625.1		10300024	4-Nitrophenol	6500	NELAP	NH	07/17/2018
EPA 625.1		10300024	Acenaphthene	5500	NELAP	NH	07/17/2018
EPA 625.1		10300024	Acenaphthylene	5505	NELAP	NH	07/17/2018
EPA 625.1		10300024	Acetophenone	5510	NELAP	NH	07/17/2018
EPA 625.1		10300024	Aniline	5545	NELAP	NH	07/17/2018
EPA 625.1		10300024	Anthracene	5555	NELAP	NH	07/17/2018
EPA 625.1		10300024	Atrazine	7065	NELAP	NH	06/17/2019
EPA 625.1		10300024	Azobenzene	5562	NELAP	NH	06/17/2019
EPA 625.1		10300024	Benzidine	5595	NELAP	NH	07/17/2018
EPA 625.1		10300024	Benzo[a]anthracene	5575	NELAP	NH	07/17/2018
EPA 625.1		10300024	Benzo[a]pyrene	5580	NELAP	NH	07/17/2018
EPA 625.1		10300024	Benzo[b]fluoranthene	5585	NELAP	NH	07/17/2018
EPA 625.1		10300024	Benzo[ghi]perylene	5590	NELAP	NH	07/17/2018
EPA 625.1		10300024	Benzo[k]fluoranthene	5600	NELAP	NH	07/17/2018
EPA 625.1		10300024	Benzoic acid	5610	NELAP	NH	07/17/2018
EPA 625.1		10300024	Benzyl alcohol	5630	NELAP	NH	07/17/2018
EPA 625.1		10300024	Butyl benzyl phthalate (Benzyl butyl phthalate)	5670	NELAP	NH	07/17/2018
EPA 625.1		10300024	Carbazole	5680	NELAP	NH	07/17/2018
EPA 625.1		10300024	Chrysene (Benzo[a]phenanthrene)	5855	NELAP	NH	07/17/2018

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Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 625.1		10300024	Di-n-butyl phthalate	5925	NELAP	NH	07/17/2018
EPA 625.1		10300024	Di-n-octyl phthalate	6200	NELAP	NH	07/17/2018
EPA 625.1		10300024	Dibenzo[a,h]anthracene	5895	NELAP	NH	07/17/2018
EPA 625.1		10300024	Dibenzofuran	5905	NELAP	NH	07/17/2018
EPA 625.1		10300024	Diethyl phthalate	6070	NELAP	NH	07/17/2018
EPA 625.1		10300024	Dimethyl phthalate	6135	NELAP	NH	07/17/2018
EPA 625.1		10300024	Fluoranthene	6265	NELAP	NH	07/17/2018
EPA 625.1		10300024	Fluorene	6270	NELAP	NH	07/17/2018
EPA 625.1		10300024	Hexachlorobenzene	6275	NELAP	NH	07/17/2018
EPA 625.1		10300024	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	07/17/2018
EPA 625.1		10300024	Hexachlorocyclopentadiene	6285	NELAP	NH	07/17/2018
EPA 625.1		10300024	Hexachloroethane	4840	NELAP	NH	07/17/2018
EPA 625.1		10300024	Indeno(1,2,3-cd)pyrene	6315	NELAP	NH	07/17/2018
EPA 625.1		10300024	Isophorone	6320	NELAP	NH	07/17/2018
EPA 625.1		10300024	N-Nitrosodi-n-propylamine	6545	NELAP	NH	07/17/2018
EPA 625.1		10300024	N-Nitrosodiethylamine	6525	NELAP	NH	07/17/2018
EPA 625.1		10300024	N-Nitrosodimethylamine	6530	NELAP	NH	07/17/2018
EPA 625.1		10300024	N-Nitrosodiphenylamine	6535	NELAP	NH	07/17/2018
EPA 625.1		10300024	N-Nitrosopyrrolidine	6565	NELAP	NH	07/17/2018
EPA 625.1		10300024	Naphthalene	5005	NELAP	NH	07/17/2018
EPA 625.1		10300024	Nitrobenzene	5015	NELAP	NH	07/17/2018
EPA 625.1		10300024	Pentachlorophenol (PCP)	6605	NELAP	NH	07/17/2018

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Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 625.1		10300024	Phenanthrene	6615	NELAP	NH	07/17/2018
EPA 625.1		10300024	Phenol	6625	NELAP	NH	07/17/2018
EPA 625.1		10300024	Pyrene	6665	NELAP	NH	07/17/2018
EPA 625.1		10300024	Pyridine	5095	NELAP	NH	07/17/2018
EPA 625.1		10300024	bis(2-Chloroethoxy)methane	5760	NELAP	NH	07/17/2018
EPA 625.1		10300024	bis(2-Chloroethyl) ether	5765	NELAP	NH	07/17/2018
EPA 625.1		10300024	bis(2-Ethylhexyl) phthalate (DEHP)	6065	NELAP	NH	07/17/2018
EPA 625.1		10300024	n-Decane	5875	NELAP	NH	07/17/2018
EPA 625.1		10300024	n-Octadecane	6580	NELAP	NH	07/17/2018
EPA 7196	A	10162400	Chromium VI	1045	NELAP	NH	06/19/2017
EPA 8011		10173009	1,2,3-Trichloropropane (1,2,3-TCP)	5180	NELAP	NH	06/17/2019
EPA 8011		10173009	1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	4570	NELAP	NH	08/03/2017
EPA 8011		10173009	1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	NELAP	NH	08/03/2017
EPA 8015	D	10305609	Diesel-range organics (DRO)	9369	NELAP	NH	06/19/2017
EPA 8015	D	10305609	Gasoline-range organics (GRO)	9408	NELAP	NH	06/19/2017
EPA 8015	D	10305609	Oil-range organics (ORO)	6748	NELAP	NH	06/17/2019
EPA 8015	D	10305609	Total petroleum hydrocarbons (TPH)	2050	NELAP	NH	12/19/2017
EPA 8081	B	10178811	4,4'-DDD	7355	NELAP	NH	06/19/2017
EPA 8081	B	10178811	4,4'-DDE	7360	NELAP	NH	06/19/2017
EPA 8081	B	10178811	4,4'-DDT	7365	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Alachlor (Lasso)	7005	NELAP	NH	06/19/2017

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Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8081	B	10178811	Aldrin (HHDN)	7025	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Chlordane (tech.)	7250	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Dieldrin	7470	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endosulfan I	7510	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endosulfan II	7515	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endosulfan sulfate	7520	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endrin	7540	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endrin aldehyde	7530	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endrin ketone	7535	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Heptachlor	7685	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Heptachlor epoxide	7690	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Methoxychlor	7810	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Toxaphene (Chlorinated camphene)	8250	NELAP	NH	06/19/2017
EPA 8081	B	10178811	alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NELAP	NH	06/19/2017
EPA 8081	B	10178811	alpha-Chlordane	7240	NELAP	NH	06/19/2017
EPA 8081	B	10178811	beta-BHC (beta-Hexachlorocyclohexane)	7115	NELAP	NH	06/19/2017
EPA 8081	B	10178811	delta-BHC (delta-Hexachlorocyclohexane)	7105	NELAP	NH	06/19/2017
EPA 8081	B	10178811	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NELAP	NH	06/19/2017
EPA 8081	B	10178811	gamma-Chlordane	7245	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1016 (PCB-1016)	8880	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1221 (PCB-1221)	8885	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1232 (PCB-1232)	8890	NELAP	NH	06/19/2017

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8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8082	A	10179201	Aroclor-1242 (PCB-1242)	8895	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1248 (PCB-1248)	8900	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1254 (PCB-1254)	8905	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1260 (PCB-1260)	8910	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1262 (PCB-1262)	8912	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1268 (PCB-1268)	8913	NELAP	NH	06/19/2017
EPA 8151	A	10183207	2,4,5-T	8655	NELAP	NH	06/19/2017
EPA 8151	A	10183207	2,4,5-TP (Silvex)	8650	NELAP	NH	06/19/2017
EPA 8151	A	10183207	2,4-D	8545	NELAP	NH	06/19/2017
EPA 8151	A	10183207	2,4-DB (Butoxon)	8560	NELAP	NH	06/19/2017
EPA 8151	A	10183207	Dalapon (2,2-Dichloropropionic acid)	8555	NELAP	NH	06/19/2017
EPA 8151	A	10183207	Dicamba	8595	NELAP	NH	06/19/2017
EPA 8151	A	10183207	Dichloroprop (Dichlorprop)	8605	NELAP	NH	06/19/2017
EPA 8151	A	10183207	Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	8620	NELAP	NH	06/19/2017
EPA 8151	A	10183207	MCPA	7775	NELAP	NH	06/19/2017
EPA 8151	A	10183207	MCPP (Mecoprop)	7780	NELAP	NH	06/19/2017
EPA 8260	D	10307127	1,1,1,2-Tetrachloroethane	5105	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1,1-Trichloroethane	5160	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1,2,2-Tetrachloroethane	5110	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	5185	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1,2-Trichloroethane	5165	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1-Dichloroethane	4630	NELAP	NH	08/18/2020

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TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8260	D	10307127	1,1-Dichloroethene (1,1-Dichloroethylene)	4640	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1-Dichloropropene	4670	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2,3-Trichlorobenzene	5150	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2,3-Trichloropropane (1,2,3-TCP)	5180	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2,4-Trichlorobenzene	5155	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2,4-Trimethylbenzene	5210	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	4570	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dichloroethane	4635	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dichloropropane	4655	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,3,5-Trichlorobenzene	6800	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,3,5-Trimethylbenzene	5215	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,3-Dichloropropane	4660	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,4-Dioxane (1,4-Diethyleneoxide)	4735	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2,2-Dichloropropane	4665	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2-Butanone (Methyl ethyl ketone, MEK)	4410	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2-Chloroethyl vinyl ether	4500	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2-Chlorotoluene	4535	NELAP	NH	08/18/2020

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 018-002 expiration date 12/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8260	D	10307127	2-Hexanone	4860	NELAP	NH	08/18/2020
EPA 8260	D	10307127	4-Chlorotoluene	4540	NELAP	NH	08/18/2020
EPA 8260	D	10307127	4-Methyl-2-pentanone (MIBK)	4995	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Acetone	4315	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Acrolein (Propenal)	4325	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Acrylonitrile	4340	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Benzene	4375	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Bromobenzene	4385	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Bromochloromethane	4390	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Bromodichloromethane	4395	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Bromoform	4400	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Carbon disulfide	4450	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Carbon tetrachloride	4455	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Chlorobenzene	4475	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Chloroethane	4485	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Chloroform	4505	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Cyclohexane	4555	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Cyclohexanone	4560	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Dibromochloromethane	4575	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Dibromomethane	4595	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Dichlorodifluoromethane (Freon 12)	4625	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Diethyl ether (Ethyl ether)	4725	NELAP	NH	08/18/2020

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Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8260	D	10307127	Diisopropyl ether (DIPE)	9375	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethanol	4750	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethyl acetate	4755	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethyl methacrylate	4810	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethyl tert-butyl ether (ETBE)	4770	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethylbenzene	4765	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Iodomethane (Methyl iodide)	4870	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Isopropyl alcohol (2-Propanol)	4895	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Isopropylbenzene (Cumene)	4900	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methyl acetate	4940	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methyl bromide (Bromomethane)	4950	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methyl chloride (Chloromethane)	4960	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methyl tert-butyl ether (MTBE)	5000	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methylcyclohexane	4965	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methylene chloride (Dichloromethane)	4975	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methylmethacrylate	4990	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Naphthalene	5005	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Pentachloroethane	5035	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Styrene	5100	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Tetrachloroethene (PCE, Perchloroethylene)	5115	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Tetrahydrofuran (THF)	5120	NELAP	NH	08/18/2020

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8260	D	10307127	Toluene	5140	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Trichloroethene (TCE, Trichloroethylene)	5170	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Trichlorofluoromethane (Freon 11)	5175	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Vinyl acetate	5225	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Vinyl chloride (Chloroethene)	5235	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Xylenes, total	5260	NELAP	NH	08/18/2020
EPA 8260	D	10307127	cis-1,2-Dichloroethene	4645	NELAP	NH	08/18/2020
EPA 8260	D	10307127	cis-1,3-Dichloropropene	4680	NELAP	NH	08/18/2020
EPA 8260	D	10307127	m+p-Xylene	5240	NELAP	NH	08/18/2020
EPA 8260	D	10307127	n-Butyl alcohol (n-Butanol, 1-Butanol)	4425	NELAP	NH	08/18/2020
EPA 8260	D	10307127	n-Butylbenzene	4435	NELAP	NH	08/18/2020
EPA 8260	D	10307127	n-Hexane	4855	NELAP	NH	08/18/2020
EPA 8260	D	10307127	n-Propylbenzene	5090	NELAP	NH	08/18/2020
EPA 8260	D	10307127	o-Xylene	5250	NELAP	NH	08/18/2020
EPA 8260	D	10307127	p-Isopropyltoluene (4-Isopropyltoluene)	4910	NELAP	NH	08/18/2020
EPA 8260	D	10307127	sec-Butylbenzene	4440	NELAP	NH	08/18/2020
EPA 8260	D	10307127	tert-Amyl methyl ether (TAME)	4370	NELAP	NH	08/18/2020
EPA 8260	D	10307127	tert-Butyl alcohol (2-Methyl-2-propanol)	4420	NELAP	NH	08/18/2020
EPA 8260	D	10307127	tert-Butylbenzene	4445	NELAP	NH	08/18/2020
EPA 8260	D	10307127	trans-1,2-Dichloroethene	4700	NELAP	NH	08/18/2020
EPA 8260	D	10307127	trans-1,3-Dichloropropene	4685	NELAP	NH	08/18/2020
EPA 8260	D	10307127	trans-1,4-Dichloro-2-butene	4605	NELAP	NH	08/18/2020

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Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8260 SIM	D	10307138	1,4-Dioxane (1,4-Diethyleneoxide)	4735	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,1'-Biphenyl (Biphenyl, Lemonene)	6703	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,2,4,5-Tetrachlorobenzene	6715	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,2,4-Trichlorobenzene	5155	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,2-Diphenylhydrazine	6220	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,3-Dinitrobenzene (1,3-DNB)	6160	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1-Methylnaphthalene	6380	NELAP	NH	12/06/2021
EPA 8270	E	10242543	2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl) ether)	4659	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,3,4,6-Tetrachlorophenol	6735	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,3-Dimethylaniline	6018	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4,5-Trichlorophenol	6835	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4,5-Trimethylaniline	6880	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4,6-Trichlorophenol	6840	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4-Dichlorophenol	6000	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4-Dimethylaniline	5883	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4-Dimethylphenol	6130	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4-Dinitrophenol	6175	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4-Dinitrotoluene (2,4-DNT)	6185	NELAP	NH	08/18/2020

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	2,6-Dinitrotoluene (2,6-DNT)	6190	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Chloronaphthalene	5795	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Chlorophenol	5800	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Ethylaniline	5869	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NELAP	NH	12/06/2021
EPA 8270	E	10242543	2-Methylnaphthalene	6385	NELAP	NH	12/06/2021
EPA 8270	E	10242543	2-Methylphenol (o-Cresol)	6400	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Naphthylamine (beta-Naphthylamine)	6430	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Nitroaniline	6460	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Nitrophenol	6490	NELAP	NH	08/18/2020
EPA 8270	E	10242543	3+4-Methylphenol (m+p-Cresol)	6412	NELAP	NH	08/18/2020
EPA 8270	E	10242543	3,3'-Dichlorobenzidine	5945	NELAP	NH	08/18/2020
EPA 8270	E	10242543	3,4-Dimethylaniline	6036	NELAP	NH	08/18/2020
EPA 8270	E	10242543	3-Nitroaniline	6465	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Bromophenyl phenyl ether	5660	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Chloro-3-methylphenol	5700	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Chloro-o-toluidine	5852	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Chloroaniline	5745	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Chlorophenyl phenyl ether	5825	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Nitroaniline	6470	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Nitrophenol	6500	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Acenaphthene	5500	NELAP	NH	08/18/2020

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Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	Acenaphthylene	5505	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Acetophenone	5510	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Aniline	5545	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Anthracene	5555	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Atrazine	7065	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzaldehyde	5570	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzidine	5595	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzo[a]anthracene	5575	NELAP	NH	12/06/2021
EPA 8270	E	10242543	Benzo[a]pyrene	5580	NELAP	NH	12/06/2021
EPA 8270	E	10242543	Benzo[b]fluoranthene	5585	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzo[ghi]perylene	5590	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzo[k]fluoranthene	5600	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzoic acid	5610	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzyl alcohol	5630	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Butyl benzyl phthalate (Benzyl butyl phthalate)	5670	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Caprolactam	7180	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Carbazole	5680	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Chrysene (Benzo[a]phenanthrene)	5855	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Di-n-butyl phthalate	5925	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Di-n-octyl phthalate	6200	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Dibenzo[a,h]anthracene	5895	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Dibenzofuran	5905	NELAP	NH	08/18/2020

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8 Walkup Drive
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DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	Diethyl phthalate	6070	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Dimethyl phthalate	6135	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Diphenylamine	6205	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Fluoranthene	6265	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Fluorene	6270	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Hexachlorobenzene	6275	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Hexachlorocyclopentadiene	6285	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Hexachloroethane	4840	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Indeno(1,2,3-cd)pyrene	6315	NELAP	NH	12/06/2021
EPA 8270	E	10242543	Isophorone	6320	NELAP	NH	12/06/2021
EPA 8270	E	10242543	N-Nitrosodi-n-propylamine	6545	NELAP	NH	08/18/2020
EPA 8270	E	10242543	N-Nitrosodimethylamine	6530	NELAP	NH	08/18/2020
EPA 8270	E	10242543	N-Nitrosodiphenylamine	6535	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Naphthalene	5005	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Nitrobenzene	5015	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Parathion, ethyl (Ethyl parathion, Parathion)	7955	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Pentachloronitrobenzene (PCNB)	6600	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Pentachlorophenol (PCP)	6605	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Phenanthrene	6615	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Phenol	6625	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Pyrene	6665	NELAP	NH	08/18/2020

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EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	Pyridine	5095	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Thionazine (Thionazin, Zinophos)	8235	NELAP	NH	08/18/2020
EPA 8270	E	10242543	bis(2-Chloroethoxy)methane	5760	NELAP	NH	08/18/2020
EPA 8270	E	10242543	bis(2-Chloroethyl) ether	5765	NELAP	NH	08/18/2020
EPA 8270	E	10242543	bis(2-Ethylhexyl) phthalate (DEHP)	6065	NELAP	NH	12/06/2021
EPA 8270	E	10242543	o-Toluidine (2-Toluidine, 2-Methylaniline)	5145	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	2-Methylnaphthalene	6385	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Acenaphthene	5500	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Acenaphthylene	5505	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Anthracene	5555	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[a]anthracene	5575	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[a]pyrene	5580	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[b]fluoranthene	5585	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[ghi]perylene	5590	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[k]fluoranthene	5600	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Chrysene (Benzo[a]phenanthrene)	5855	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Dibenzo[a,h]anthracene	5895	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Fluoranthene	6265	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Fluorene	6270	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Hexachlorobenzene	6275	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	08/18/2020

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270 SIM	E	10242565	Indeno(1,2,3-cd)pyrene	6315	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Naphthalene	5005	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Pentachlorophenol (PCP)	6605	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Phenanthrene	6615	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Pyrene	6665	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	bis(2-Chloroethyl) ether	5765	NELAP	NH	10/19/2022
EPA 8315	A	10188008	Formaldehyde	4815	NELAP	NH	06/19/2017
EPA 9010	C	10193109	Total cyanide	1645	NELAP	NH	06/19/2017
EPA 9012	B	10243228	Amenable cyanide	1510	NELAP	NH	07/17/2018
EPA 9012	B	10243228	Total cyanide	1645	NELAP	NH	12/19/2017
EPA 9014		10193803	Cyanide	1635	NELAP	NH	12/19/2017
EPA 9030	B	10195605	Sulfide distillation	1455	NELAP	NH	06/19/2017
EPA 9038		10196608	Sulfate	2000	NELAP	NH	06/19/2017
EPA 9040	C	10244403	pH	1900	NELAP	NH	06/19/2017
EPA 9050	A	10198808	Conductivity	1610	NELAP	NH	09/15/2017
EPA 9056	A	10199607	Chloride	1575	NELAP	NH	09/15/2017
EPA 9056	A	10199607	Fluoride	1730	NELAP	NH	09/15/2017
EPA 9056	A	10199607	Nitrate as N	1810	NELAP	NH	09/15/2017
EPA 9056	A	10199607	Sulfate	2000	NELAP	NH	09/15/2017
EPA 9060	A	10244823	Total organic carbon (TOC)	2040	NELAP	NH	09/15/2017
EPA 9065		10200405	Total phenolics	1905	NELAP	NH	06/19/2017
EPA 9251		10207406	Chloride	1575	NELAP	NH	06/19/2017

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DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
NJDEP 10/08, Rev. 3	3	90014258	Extractable petroleum hydrocarbons	6241	NELAP	NH	06/19/2017
SM 2120B - 2011	Online ed.	20039310	Color	1605	NELAP	NH	06/19/2017
SM 2130B - 2011	Online ed.	20048220	Turbidity	2055	NELAP	NH	06/19/2017
SM 2310B - 2011	Online ed.	20044615	Acidity as CaCO3	1500	NELAP	NH	06/19/2017
SM 2320B - 2011	Online ed.	20045618	Alkalinity as CaCO3	1505	NELAP	NH	06/19/2017
SM 2510B - 2011	Online ed.	20048617	Conductivity	1610	NELAP	NH	06/19/2017
SM 2520B - 2011	Online	20040088	Salinity	1975	NELAP	NH	06/19/2017
SM 2540B - 2015	Online ed.	20049438	Residue, total	1950	NELAP	NH	06/19/2017
SM 2540C - 2015	Online ed.	20050435	Residue, filterable (TDS)	1955	NELAP	NH	06/19/2017
SM 2540D - 2015	Online ed.	20051223	Residue, nonfilterable (TSS)	1960	NELAP	NH	06/19/2017
SM 2540E - 2015	Online ed.	20051610	Residue, volatile	1970	NELAP	NH	07/15/2021
SM 2540F - 2015	Online ed.	20052226	Residue, settleable	1965	NELAP	NH	06/19/2017
SM 3500-Cr B - 2011	Online ed.	20066266	Chromium VI	1045	NELAP	NH	06/19/2017
SM 3500-Fe B - 2011	Online ed.	20069016	Ferrous iron	1073	NELAP	NH	09/15/2017
SM 4500-CN- C - 2016	Online ed.	20065672	Cyanide distillation	1412	NELAP	NH	06/19/2017
SM 4500-CN- E - 2016	Online ed.	20096439	Total cyanide	1645	NELAP	NH	06/19/2017
SM 4500-Cl D - 2011	Online ed.	20080120	Total residual chlorine	1940	NELAP	NH	12/02/2024
SM 4500-Cl G - 2011	Online ed.	20081623	Total residual chlorine	1940	NELAP	NH	12/02/2024
SM 4500-Cl- E - 2011	Online ed.	20086811	Chloride	1575	NELAP	NH	06/19/2017
SM 4500-F- B - 2011	Online ed.	20101411	Preliminary distillation of fluoride	1477	NELAP	NH	06/19/2017
SM 4500-F- C - 2011	Online ed.	20102414	Fluoride	1730	NELAP	NH	06/19/2017
SM 4500-H + B - 2011	Online ed.	20105220	pH	1900	NELAP	NH	06/19/2017

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DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
SM 4500-NH3 B - 2011	Online ed.	20106018	Ammonia distillation	1404	NELAP	NH	06/19/2017
SM 4500-NH3 H - 2011	Online ed.	20112214	Ammonia as N	1515	NELAP	NH	06/19/2017
SM 4500-NH3 H - 2011	Online ed.	20112214	Kjeldahl nitrogen, total (TKN)	1795	NELAP	NH	08/03/2017
SM 4500-NO2- B - 2011	Online ed.	20113115	Nitrite as N	1840	NELAP	NH	06/19/2017
SM 4500-NO3- F - 2016	Online ed.	20117684	Nitrate as N	1810	NELAP	NH	09/15/2017
SM 4500-NO3- F - 2016	Online ed.	20117684	Nitrite as N	1840	NELAP	NH	06/19/2017
SM 4500-NO3- F - 2016	Online ed.	20117684	Total nitrate-nitrite	1820	NELAP	NH	06/19/2017
SM 4500-Norg C - 2011	Online ed.	20120018	Kjeldahl nitrogen, total (TKN)	1795	NELAP	NH	08/03/2017
SM 4500-O C - 2016	23rd ed.	20210712	Oxygen (dissolved)	1880	NELAP	NH	11/22/2023
SM 4500-P B - 2011	Online ed.	20123368	Preliminary treatment of phosphate samples	1479	NELAP	NH	06/19/2017
SM 4500-P E - 2011	Online ed.	20124225	Orthophosphate as P	1870	NELAP	NH	06/19/2017
SM 4500-P E - 2011	Online ed.	20124225	Phosphorus, total	1910	NELAP	NH	06/19/2017
SM 4500-S2- D - 2011	Online ed.	20125864	Sulfide	2005	NELAP	NH	06/19/2017
SM 4500-SO3- B - 2011	Online ed.	20130636	Sulfite, SO3	2015	NELAP	NH	06/19/2017
SM 4500-SO4 E - 2011	Online ed.	20132461	Sulfate	2000	NELAP	NH	06/19/2017
SM 5210B - 2016	Online ed.	20135039	Biochemical oxygen demand (BOD)	1530	NELAP	NH	06/19/2017
SM 5210B - 2016	Online ed.	20135039	Carbonaceous BOD (CBOD)	1555	NELAP	NH	06/19/2017
SM 5220D - 2011	Online ed.	20136816	Chemical oxygen demand (COD)	1565	NELAP	NH	06/19/2017
SM 5310C - 2014	Online ed.	20138834	Total organic carbon (TOC)	2040	NELAP	NH	06/19/2017
SM 5540C - 2011	Online ed.	20145066	Surfactants as MBAS	2025	NELAP	NH	06/19/2017
SM 5550B - 1993	20th ed.	20029316	Tannin and lignin	9597	NELAP	NH	06/19/2017

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DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Non-Potable Water

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
ASTM D3987-12		30030718	Shake extraction of solid waste with water	1386	NELAP	NH	06/19/2017
EPA 1010	A	10234807	Ignitability	1780	NELAP	NH	06/19/2017
EPA 1030		10117201	Ignitability	1780	NELAP	NH	06/19/2017
EPA 1311		10118806	Toxicity characteristic leaching procedure (TCLP)	1466	NELAP	NH	06/19/2017
EPA 1312		10119003	Synthetic precipitation leaching procedure (SPLP)	1460	NELAP	NH	06/19/2017
EPA 3060	A	10136604	Alkaline digestion of Cr(VI)	1402	NELAP	NH	06/19/2017
EPA 350.1	2.0	10063602	Ammonia as N	1515	NELAP	PA	12/07/2009
EPA 3540	C	10140202	Soxhlet extraction	1452	NELAP	NH	06/19/2017
EPA 3546		10141205	Microwave extraction	1428	NELAP	NH	06/19/2017
EPA 3550	C	10142004	Ultrasonic extraction	1468	NELAP	NH	06/19/2017
EPA 3580	A	10143007	Waste dilution	1470	NELAP	NH	06/19/2017
EPA 3620	C	10146006	Florisil cleanup	1414	NELAP	NH	06/19/2017
EPA 3630	C	10146802	Silica gel cleanup	1446	NELAP	NH	06/19/2017
EPA 3660	B	10148400	Sulfur cleanup	1456	NELAP	NH	06/19/2017
EPA 3665	A	10148808	Sulfuric acid/permanganate clean-up	1458	NELAP	NH	06/19/2017
EPA 5035	A	10284807	Closed-system purge-and-trap (bisulfate option)	1390	NELAP	NH	07/17/2018
EPA 5035	A	10284807	Closed-system purge-and-trap (methanol option)	1392	NELAP	NH	07/17/2018

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DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 5035	A	10284807	Closed-system purge-and-trap (unpreserved)	1393	NELAP	NH	07/17/2018
EPA 7196	A	10162400	Chromium VI	1045	NELAP	NH	06/19/2017
EPA 8015	D	10305609	Diesel-range organics (DRO)	9369	NELAP	NH	06/19/2017
EPA 8015	D	10305609	Gasoline-range organics (GRO)	9408	NELAP	NH	06/19/2017
EPA 8015	D	10305609	Oil-range organics (ORO)	6748	NELAP	NH	06/17/2019
EPA 8081	B	10178811	4,4'-DDD	7355	NELAP	NH	06/19/2017
EPA 8081	B	10178811	4,4'-DDE	7360	NELAP	NH	06/19/2017
EPA 8081	B	10178811	4,4'-DDT	7365	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Alachlor (Lasso)	7005	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Aldrin (HHDN)	7025	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Chlordane (tech.)	7250	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Dieldrin	7470	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endosulfan I	7510	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endosulfan II	7515	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endosulfan sulfate	7520	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endrin	7540	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endrin aldehyde	7530	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Endrin ketone	7535	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Heptachlor	7685	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Heptachlor epoxide	7690	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Methoxychlor	7810	NELAP	NH	06/19/2017
EPA 8081	B	10178811	Toxaphene (Chlorinated camphene)	8250	NELAP	NH	06/19/2017

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DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8081	B	10178811	alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NELAP	NH	06/19/2017
EPA 8081	B	10178811	alpha-Chlordane	7240	NELAP	NH	06/19/2017
EPA 8081	B	10178811	beta-BHC (beta-Hexachlorocyclohexane)	7115	NELAP	NH	06/19/2017
EPA 8081	B	10178811	delta-BHC (delta-Hexachlorocyclohexane)	7105	NELAP	NH	06/19/2017
EPA 8081	B	10178811	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NELAP	NH	06/19/2017
EPA 8081	B	10178811	gamma-Chlordane	7245	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1016 (PCB-1016)	8880	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1221 (PCB-1221)	8885	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1232 (PCB-1232)	8890	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1242 (PCB-1242)	8895	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1248 (PCB-1248)	8900	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1254 (PCB-1254)	8905	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1260 (PCB-1260)	8910	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1262 (PCB-1262)	8912	NELAP	NH	06/19/2017
EPA 8082	A	10179201	Aroclor-1268 (PCB-1268)	8913	NELAP	NH	06/19/2017
EPA 8151	A	10183207	2,4,5-T	8655	NELAP	NH	06/19/2017
EPA 8151	A	10183207	2,4,5-TP (Silvex)	8650	NELAP	NH	06/19/2017
EPA 8151	A	10183207	2,4-D	8545	NELAP	NH	06/19/2017
EPA 8151	A	10183207	2,4-DB (Butoxon)	8560	NELAP	NH	06/19/2017
EPA 8151	A	10183207	Dalapon (2,2-Dichloropropionic acid)	8555	NELAP	NH	06/19/2017
EPA 8151	A	10183207	Dicamba	8595	NELAP	NH	06/19/2017
EPA 8151	A	10183207	Dichloroprop (Dichlorprop)	8605	NELAP	NH	06/19/2017

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DEP Laboratory ID: 68-03671
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TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8151	A	10183207	MCPA	7775	NELAP	NH	06/19/2017
EPA 8151	A	10183207	MCPP (Mecoprop)	7780	NELAP	NH	06/19/2017
EPA 8260	D	10307127	1,1,1,2-Tetrachloroethane	5105	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1,1-Trichloroethane	5160	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1,2,2-Tetrachloroethane	5110	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	5185	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1,2-Trichloroethane	5165	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1-Dichloroethane	4630	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1-Dichloroethene (1,1-Dichloroethylene)	4640	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,1-Dichloropropene	4670	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2,3-Trichlorobenzene	5150	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2,3-Trichloropropane (1,2,3-TCP)	5180	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2,4-Trichlorobenzene	5155	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2,4-Trimethylbenzene	5210	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	4570	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dichloroethane	4635	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,2-Dichloropropane	4655	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,3,5-Trichlorobenzene	6800	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,3,5-Trimethylbenzene	5215	NELAP	NH	08/18/2020

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Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8260	D	10307127	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,3-Dichloropropane	4660	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NELAP	NH	08/18/2020
EPA 8260	D	10307127	1,4-Dioxane (1,4-Diethyleneoxide)	4735	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2,2-Dichloropropane	4665	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2-Butanone (Methyl ethyl ketone, MEK)	4410	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2-Chloroethyl vinyl ether	4500	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2-Chlorotoluene	4535	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2-Hexanone	4860	NELAP	NH	08/18/2020
EPA 8260	D	10307127	2-Nitropropane	5020	NELAP	NH	08/18/2020
EPA 8260	D	10307127	4-Chlorotoluene	4540	NELAP	NH	08/18/2020
EPA 8260	D	10307127	4-Methyl-2-pentanone (MIBK)	4995	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Acetone	4315	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Acrolein (Propenal)	4325	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Acrylonitrile	4340	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Allyl chloride (3-Chloropropene)	4355	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Benzene	4375	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Bromobenzene	4385	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Bromochloromethane	4390	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Bromodichloromethane	4395	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Bromoform	4400	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Carbon disulfide	4450	NELAP	NH	08/18/2020

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8260	D	10307127	Carbon tetrachloride	4455	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Chlorobenzene	4475	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Chlorodifluoromethane (Freon 22)	4577	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Chloroethane	4485	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Chloroform	4505	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Cyclohexane	4555	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Cyclohexanone	4560	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Dibromochloromethane	4575	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Dibromomethane	4595	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Dichlorodifluoromethane (Freon 12)	4625	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Diethyl ether (Ethyl ether)	4725	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Diisopropyl ether (DIPE)	9375	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethanol	4750	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethyl acetate	4755	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethyl methacrylate	4810	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethyl tert-butyl ether (ETBE)	4770	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Ethylbenzene	4765	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Hexachloroethane	4840	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Iodomethane (Methyl iodide)	4870	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Isopropylbenzene (Cumene)	4900	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methyl acetate	4940	NELAP	NH	08/18/2020

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8 Walkup Drive
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(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8260	D	10307127	Methyl bromide (Bromomethane)	4950	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methyl chloride (Chloromethane)	4960	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methyl tert-butyl ether (MTBE)	5000	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methylcyclohexane	4965	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methylene chloride (Dichloromethane)	4975	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Methylmethacrylate	4990	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Naphthalene	5005	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Nitrobenzene	5015	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Styrene	5100	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Tetrachloroethene (PCE, Perchloroethylene)	5115	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Tetrahydrofuran (THF)	5120	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Toluene	5140	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Trichloroethene (TCE, Trichloroethylene)	5170	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Trichlorofluoromethane (Freon 11)	5175	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Vinyl acetate	5225	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Vinyl chloride (Chloroethene)	5235	NELAP	NH	08/18/2020
EPA 8260	D	10307127	Xylenes, total	5260	NELAP	NH	08/18/2020
EPA 8260	D	10307127	cis-1,2-Dichloroethene	4645	NELAP	NH	08/18/2020
EPA 8260	D	10307127	cis-1,3-Dichloropropene	4680	NELAP	NH	08/18/2020
EPA 8260	D	10307127	m+p-Xylene	5240	NELAP	NH	08/18/2020
EPA 8260	D	10307127	n-Butyl alcohol (n-Butanol, 1-Butanol)	4425	NELAP	NH	08/18/2020
EPA 8260	D	10307127	n-Butylbenzene	4435	NELAP	NH	08/18/2020

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8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8260	D	10307127	n-Hexane	4855	NELAP	NH	11/22/2023
EPA 8260	D	10307127	n-Propylbenzene	5090	NELAP	NH	08/18/2020
EPA 8260	D	10307127	o-Xylene	5250	NELAP	NH	08/18/2020
EPA 8260	D	10307127	p-Isopropyltoluene (4-Isopropyltoluene)	4910	NELAP	NH	08/18/2020
EPA 8260	D	10307127	sec-Butylbenzene	4440	NELAP	NH	08/18/2020
EPA 8260	D	10307127	tert-Amyl methyl ether (TAME)	4370	NELAP	NH	08/18/2020
EPA 8260	D	10307127	tert-Butyl alcohol (2-Methyl-2-propanol)	4420	NELAP	NH	08/18/2020
EPA 8260	D	10307127	tert-Butylbenzene	4445	NELAP	NH	08/18/2020
EPA 8260	D	10307127	trans-1,2-Dichloroethene	4700	NELAP	NH	08/18/2020
EPA 8260	D	10307127	trans-1,3-Dichloropropene	4685	NELAP	NH	08/18/2020
EPA 8260	D	10307127	trans-1,4-Dichloro-2-butene	4605	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,1'-Biphenyl (Biphenyl, Lemonene)	6703	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,2,4,5-Tetrachlorobenzene	6715	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,2,4-Trichlorobenzene	5155	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,2-Diphenylhydrazine	6220	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1,4-Dioxane (1,4-Diethyleneoxide)	4735	NELAP	NH	08/18/2020
EPA 8270	E	10242543	1-Methylnaphthalene	6380	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl) ether)	4659	NELAP	NH	08/18/2020

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8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	2,3,4,6-Tetrachlorophenol	6735	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4,5-Trichlorophenol	6835	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4,6-Trichlorophenol	6840	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4-Dichlorophenol	6000	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4-Dimethylphenol	6130	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4-Dinitrophenol	6175	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,4-Dinitrotoluene (2,4-DNT)	6185	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2,6-Dinitrotoluene (2,6-DNT)	6190	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Chloronaphthalene	5795	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Chlorophenol	5800	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Methylnaphthalene	6385	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Methylphenol (o-Cresol)	6400	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Nitroaniline	6460	NELAP	NH	08/18/2020
EPA 8270	E	10242543	2-Nitrophenol	6490	NELAP	NH	08/18/2020
EPA 8270	E	10242543	3+4-Methylphenol (m+p-Cresol)	6412	NELAP	NH	08/18/2020
EPA 8270	E	10242543	3,3'-Dichlorobenzidine	5945	NELAP	NH	08/18/2020
EPA 8270	E	10242543	3-Nitroaniline	6465	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Bromophenyl phenyl ether	5660	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Chloro-3-methylphenol	5700	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Chloroaniline	5745	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Chlorophenyl phenyl ether	5825	NELAP	NH	08/18/2020

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Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	4-Nitroaniline	6470	NELAP	NH	08/18/2020
EPA 8270	E	10242543	4-Nitrophenol	6500	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Acenaphthene	5500	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Acenaphthylene	5505	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Acetophenone	5510	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Aniline	5545	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Anthracene	5555	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Atrazine	7065	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzaldehyde	5570	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzidine	5595	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzo[a]anthracene	5575	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzo[a]pyrene	5580	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzo[b]fluoranthene	5585	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzo[ghi]perylene	5590	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzo[k]fluoranthene	5600	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzoic acid	5610	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Benzyl alcohol	5630	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Butyl benzyl phthalate (Benzyl butyl phthalate)	5670	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Caprolactam	7180	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Carbazole	5680	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Chrysene (Benzo[a]phenanthrene)	5855	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Di-n-butyl phthalate	5925	NELAP	NH	08/18/2020

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8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	Di-n-octyl phthalate	6200	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Dibenzo[a,h]anthracene	5895	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Dibenzofuran	5905	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Diethyl phthalate	6070	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Dimethyl phthalate	6135	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Diphenylamine	6205	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Fluoranthene	6265	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Fluorene	6270	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Hexachlorobenzene	6275	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Hexachlorocyclopentadiene	6285	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Hexachloroethane	4840	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Indeno(1,2,3-cd)pyrene	6315	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Isophorone	6320	NELAP	NH	08/18/2020
EPA 8270	E	10242543	N-Nitrosodi-n-propylamine	6545	NELAP	NH	08/18/2020
EPA 8270	E	10242543	N-Nitrosodimethylamine	6530	NELAP	NH	08/18/2020
EPA 8270	E	10242543	N-Nitrosodiphenylamine	6535	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Naphthalene	5005	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Nitrobenzene	5015	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Parathion, ethyl (Ethyl parathion, Parathion)	7955	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Pentachloronitrobenzene (PCNB)	6600	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Pentachlorophenol (PCP)	6605	NELAP	NH	08/18/2020

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DEP Laboratory ID: 68-03671
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Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270	E	10242543	Phenanthrene	6615	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Phenol	6625	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Pyrene	6665	NELAP	NH	08/18/2020
EPA 8270	E	10242543	Pyridine	5095	NELAP	NH	08/18/2020
EPA 8270	E	10242543	bis(2-Chloroethoxy)methane	5760	NELAP	NH	08/18/2020
EPA 8270	E	10242543	bis(2-Chloroethyl) ether	5765	NELAP	NH	08/18/2020
EPA 8270	E	10242543	bis(2-Ethylhexyl) phthalate (DEHP)	6065	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	1-Methylnaphthalene	6380	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	2-Methylnaphthalene	6385	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Acenaphthene	5500	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Acenaphthylene	5505	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Anthracene	5555	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[a]anthracene	5575	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[a]pyrene	5580	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[b]fluoranthene	5585	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[ghi]perylene	5590	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Benzo[k]fluoranthene	5600	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Chrysene (Benzo[a]phenanthrene)	5855	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Dibenzo[a,h]anthracene	5895	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Fluoranthene	6265	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Fluorene	6270	NELAP	NH	08/18/2020

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Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
EPA 8270 SIM	E	10242565	Hexachlorobenzene	6275	NELAP	NH	12/06/2021
EPA 8270 SIM	E	10242565	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	4835	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Indeno(1,2,3-cd)pyrene	6315	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Naphthalene	5005	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Pentachlorophenol (PCP)	6605	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Phenanthrene	6615	NELAP	NH	08/18/2020
EPA 8270 SIM	E	10242565	Pyrene	6665	NELAP	NH	08/18/2020
EPA 9010	C	10193109	Total cyanide	1645	NELAP	NH	06/19/2017
EPA 9012	B	10243228	Amenable cyanide	1510	NELAP	NH	07/17/2018
EPA 9012	B	10243228	Total cyanide	1645	NELAP	NH	06/19/2017
EPA 9014		10193803	Total cyanide	1645	NELAP	NH	06/19/2017
EPA 9034		10196006	Sulfide	2005	NELAP	NH	03/10/2025
EPA 9038		10196608	Sulfate	2000	NELAP	NH	06/19/2017
EPA 9040	C	10244403	Corrosivity (pH)	1625	NELAP	NH	06/19/2017
EPA 9045	D	10198455	Corrosivity (pH)	1625	NELAP	NH	06/19/2017
EPA 9050	A	10198808	Conductivity	1610	NELAP	NH	06/19/2017
EPA 9065		10200405	Total phenolics	1905	NELAP	NH	06/19/2017
EPA 9071	B	10201806	Oil and grease	1803	NELAP	NH	06/19/2017
EPA 9095	B	10245600	Paint filter liquids test	1434	NELAP	NH	06/19/2017
EPA 9251		10207406	Chloride	1575	NELAP	NH	06/19/2017
NJDEP 10/08, Rev. 3	3	90014258	Extractable petroleum hydrocarbons	6241	NELAP	NH	06/19/2017
SM 2540G - 1991	18th ed.	20005203	Total, fixed, and volatile residue	1725	NELAP	NH	06/19/2017

Annmarie Beach

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 018-002 expiration date 12/31/2025. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

Pace Analytical Services LLC - Westborough, MA
8 Walkup Drive
Westborough, MA 01581
(508) 898-9220

DEP Laboratory ID: 68-03671
EPA Lab Code: MA00086
TNI Code: TNI01316

Matrix: Solid and Chemical Materials

Method	Revision	TNI Method Code	Analyte	TNI Analyte Code	Accreditation Type	Primary State	Effective Date
SM 4500-NH3 B - 2011	22nd ed.	20105811	Ammonia distillation	1404	NELAP	PA	05/08/2012
SM 4500-NH3 H - 2011	22nd ed.	20112010	Ammonia as N	1515	NELAP	PA	12/07/2009

Annmarie Beach

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

Attachment 3

RETTEW

We answer to you.

3020 Columbia Avenue, Lancaster, PA 17603 ● Phone: (800) 738-8395
E-mail: rettew@rettew.com ● Website: rettew.com

Engineers

Environmental Consultants

Surveyors

Landscape Architects

Safety Consultants

March 6, 2025

Mr. Bradford L. Fish
Energy Transfer
100 Green Street
Marcus Hook, PA 19061

RE: Borehole Logging Survey
Residential Well
121 Glenwood Drive
Upper Makefield Township, PA
RETTEW Project No. 0963003386

Dear Mr. Fish,

On February 10, 2025, RETTEW completed a geophysical borehole survey at the above-referenced site. The purpose of the survey was to locate and characterize fractures and potential water-bearing zones intersecting the above-referenced residential well. To accomplish these objectives, RETTEW conducted Optical Televiewer, Acoustic Televiewer, Mechanical Caliper, Fluid Temperature, Fluid Conductivity, and Natural Gamma. The procedures and geophysical technics utilized are briefly described in the sections below. A summary of the notable features identified is presented in the "Logging Results" section.

LOGGING EQUIPMENT

RETTEW conducts borehole geophysics and televiewer logging using a Mt. Sopris MX Series winch and SCOUT Pro data acquisition system. This unit records digital data for on-site log playback, reproduction, and field interpretation, as well as post-processing and report presentation. The systems are driven by field PCs running software supplied by the manufacturer for data acquisition, log replay, probe control, probe calibration, and logging environment compensation.

DECONTAMINATION PROCEDURE

Prior to RETTEW's mobilization to the site, the winch cable and sondes scheduled for use are decontaminated, to ensure the quality of sampling by preventing cross-contamination. The procedure described below was implemented both before and after logging. The equipment used for decontamination is listed below.

- Distilled water
- Seventh Generation solution (mixed with distilled water)
- Stiff-bristle brush
- Manual pump spray bottle
- Heavy duty paper towels
- 5-gallon bucket with lid.

The procedure used for decontamination is listed below.

1. A decontamination area is designated and set-up.
2. Proper personal protective equipment is donned (i.e., nitrile gloves, safety glasses).

3. Sondes are removed from their containers and placed in the decontamination area.
4. Mixed detergent solution is applied to each sonde with a manual pump spray bottle.
5. Sondes are manually wiped down with a paper towel or scrubbed with a stiff bristle brush, depending on the amount of mud or dirt on the sonde.
6. Sondes are rinsed with distilled water and dried with a paper towel.
7. Discarded water is captured in a 5-gallon bucket, which is sealed for proper disposal and not allowed to infiltrate the soil.
8. If a sonde is still visibly contaminated, the process is repeated as necessary.
9. Decontamination of the winch cable is performed during the first deployment of a sonde down a borehole, and on the last retrieval of a sonde, for each borehole.
10. Mixed detergent solution is sprayed on paper towels, and the cable is wiped down on its initial deployment down a borehole.
11. Paper towels are monitored for cleanliness and replaced as necessary.
12. Cable decontamination process is repeated on the final recovery of a sonde, for each borehole.

LOGGING PARAMETERS AND METHODOLOGY

Geophysical well logging in general involves lowering sondes in a borehole and recording parameters that are related to the properties of the adjacent soil or rock, the fluids in the borehole or formation, and/or construction details of the well. There are many tools and techniques that have been developed to provide specific information in different environments and constructions of drilled holes. The data collected can define the nature and extent of geologic formations and formation fluids and can be used to provide correlation between holes.

The sondes used for this survey are described below. Note that RETTEW personnel test them for proper function and recalibrate periodically, as necessary. This is essential to the proper acquisition of downhole data and the ability to relate the data from one borehole to another.

OPTICAL TELEVIEWER

The borehole optical televiewer (OPTV) provides a high-resolution digital optical scan of the interior of a borehole using visible wavelength light. From the accurately scaled, continuous image it is possible to identify the depth and character of features such as fractures, bedding planes, veins, solution openings, etc. It is possible to calculate the strike, dip, and aperture of planar features. The OPTV operates by using a high-resolution color downhole camera, which views a reflection of the borehole walls in a hyperbolic correction mirror. At successive depth increments of 0.5 mm, rings of pixels corresponding to circular scans of the borehole wall are acquired from the probe and stacked into a continuous image. The image is rectangular – representing the interior of a cylinder that has been sliced open and rolled out flat. The image is oriented to north, based on data from three magnetometers and accelerometers in the sonde. Note that the use of magnetometers for orientation leads to image distortion in steel-cased holes, and within several feet of the base of steel casing in open holes. All OPTV sondes require an open borehole, or one filled with a clear fluid.

ACOUSTIC TELEVIEWER

The high-resolution acoustic televiewer (HRAT) provides a scan or image of the interior of the borehole

that is created not by reflected visible wavelength light, but by reflected ultrasound. Since ultrasonic pulses are used, it is possible to record both the amplitude and travel time of each pulse and construct two separate images. The amplitude log is analogous to a visual scan, while the travel time data are affected primarily by the local diameter of the borehole (i.e., the larger the bore, the later the arrival of the reflected pulse), and therefore can supplement or replace a caliper log. The main advantage of the HRAT probe is that it can be used in larger boreholes than optical tools, and in holes with turbid or particle-loaded fluids that would be opaque to optical methods.

The HRAT operates by using a fixed acoustic transducer and a rotating acoustic mirror capable of focusing on the borehole wall at any distance from the probe diameter upwards. The acoustic transducer is focused based on the borehole diameter, and impedance-matched to the borehole fluid, to provide optimum image resolution and reflected amplitude. Mirror rotation speed (i.e., circumferential resolution), sampling rate (i.e., depth resolution), signal gain (i.e., amplitude image contrast), and recording time gate (i.e., travel time image contrast) are all variable and under operator control to provide the best image possible under borehole-specific conditions.

Planar features intersecting a cylindrical borehole appear sinusoidal on the flattened cylindrical image. The azimuth of the peak/trough of the sinusoid, and the amplitude of the sinusoid, can be measured and used to calculate the strike and dip (see **Appendix A**) of such features. Based on their visual character, planar features on the HRAT (and OPTV- see above) logs are categorized on the log sheets as various types of geologic interface (fractures, bedding planes, foliation, etc.). Once sinusoids are fit to the structures, they are corrected for borehole tilt, corrected for declination using NOAA's "Estimated Value of Magnetic Declination" online calculator for each well location, and are listed in the Planar Features Characterization Table (**Appendix B**) and plotted on a Wulff stereonet in **Appendix C**.

Tables listing the depth, aperture, strike, dip, and type of feature are included for each well. Based on their visual character, planar features are categorized as various types of geologic interface (fractures, bedding planes, foliation, etc.). Feature apertures are listed in tenths of an inch. An aperture of zero for an open fracture simply means that while it appears to be a continuous open feature, the opening is smaller than the line thickness on the log (~0.019 inches).

Please note that feature measurements present within five feet of the bottom of a steel casing may be distorted due to metallic interference with the internal magnetometer. Note also that it has been the experience of RETTEW that the aperture of a feature is not always a strong indicator of its water-producing potential. Thin, discrete features sometimes produce as much or more water than wide, open fractures or fracture zones.

MECHANICAL CALIPER

Caliper measurements represent the average diameter of the borehole, or well, at a given depth. The caliper tool collects and transmits the data from three spring-loaded arms as the tool is lifted upwards through the borehole. The caliper tool is used to locate solution openings or fractures (where the borehole is typically enlarged due either to the presence of natural openings, or to plucking of broken rock by the drill bit), and to determine the length of casing intervals (as evident from small changes in casing diameter, or the small enlargements at threaded junctions, or narrowing due to the bead at welded junctions).

Caliper logs are collected by calibrating the downhole tool with a measuring template, lowering the tool to the base of the well, remotely opening the arms, and then logging the open borehole and casing

diameter in an upward direction. Caliper logs are acquired with a logging speed of no more than 12 feet per minute (fpm).

FLUID TEMPERATURE

Fluid temperature logs provide the temperature of the air or fluid in a borehole as a function of depth. Temperature logs can indicate where water is entering or leaving a borehole – and thereby disturbing the normal geothermal gradient. Deviations, offsets, or changes in the slope of the temperature log can be used to locate zones of water movement within the borehole. Temperature logs must be run in wells that have been allowed to fully equilibrate to the local geothermal gradient following any prior drilling, construction, pumping, or sampling. During a temperature survey, data accuracy is ensured by maintaining a downward logging speed of approximately 10 fpm. This provides an adequate time buffer to allow sensors to respond to minor temperature changes.

FLUID CONDUCTIVITY

Fluid conductivity logs provide a continuous measurement of the electrical conductivity of the borehole fluid- i.e., zero in air or hydrocarbons, greater than zero in water. In water, electrical conductivity is mostly a function of electrolytic content. Water with very low dissolved solid concentrations will yield low fluid conductivity, while water containing a high level of dissolved solids will be proportionally more conductive. Fluid conductivity logs often deflect where water-producing features are transmitting water into or out of the well (since the well water may have a differing electrolytic chemistry than the formation water). The fluid conductivity log is usually collected simultaneously with the temperature log – since for both, data from a fully equilibrated water column is required.

NATURAL GAMMA

Gamma logs are one of the most widely used geophysical logs in groundwater applications. They are used primarily to identify changes in lithology – specifically, the relative amounts of clay in various sedimentary units.

A gamma log provides a record of the total natural gamma radiation detected within a given energy range. In water-bearing rocks and sediments that are not contaminated by artificial radioisotopes, the most significant naturally occurring, gamma-emitting radioisotopes are potassium-40 and the daughter products of the uranium and thorium decay series. If gamma-emitting artificial radioisotopes have been introduced by humans into the groundwater system, they will also produce part of the radiation measured.

The amplitude of gamma-log deflections is affected by any borehole condition that alters the density of the material through which gamma photons must pass, or the length of the travel path. The bedding of a gamma-emitting formation must be thick to obtain a quantitative value, since the detector will be affected by the radiation from the formation as the tool approaches and passes the bed. Although increases in borehole diameter, or the presence of steel casing, will decrease the recorded gamma count, it is possible to collect usable information in both cased and open portions of the borehole using the gamma sonde. The presence of potassium-rich (and therefore gamma-emitting) bentonite clay commonly used in well construction will generally produce high gamma count peaks on a natural gamma log. RETTEW has natural gamma detectors on many sondes, and comparison of the multiple gamma logs collected for any given well logging program are used to ensure that the depths of differing logs are not erroneously shifted. Therefore, the gamma log presented for any well may have been collected simultaneously with any of the other logs from the same well.

LOGGING RESULTS

The logging results for the well are presented on the enclosed digital logs and tables are briefly summarized below.

Note that since analysis of borehole geophysical logs can be quite subjective, and the level of detail is dependent upon the specific goals of the geologist, the analysis below by RETTEW covers the major features of each log – as well as some possibly minor features – to serve as examples (or guides) for further interpretation by geologists familiar with the site, local geology, and/or project goals. In general, logs may display deviations (i.e., "spikes" where the parameter deviates from, and then returns to, "background" level), offsets (changes in background level), or slope changes. Any of these could be considered significant in certain situations, or when compared to correlating features at the same depth on other logs.

121 Glenwood Drive-Residential Well

NOTABLE FEATURES

- The total depth of the well was measured at approximately 141.0 feet below "top of casing" (TOC).
- The depth to water was measured at 28.9 feet below TOC at the beginning of the survey.
- The diameter of the casing at the surface was measured to be nominally 6 inches, and the bottom of the casing was located at approximately 29.8 feet below TOC.
- The caliper log showed notable enlargements due to fracturing centered near 32.0, 45.5, 67.5, 79.0, and 131.5 feet below TOC.
- The fluid conductivity was consistent throughout most of the well but exhibited a notable increase from 132.0 feet below TOC through the bottom of the borehole.
- The fluid temperature was consistent throughout the borehole.
- The natural gamma log varied uniformly throughout the well.
- Planar features were recognizable on the acoustic and optical televiewer logs. The depth, strike, dip, aperture, and feature type are listed on the logs – as well as on the accompanying table.

LIMITATIONS

The survey described above was completed using standard and/or routinely accepted practices of the geophysical industry, and the equipment employed represents, in RETTEW's professional opinion, the best available technology. RETTEW does not accept responsibility for survey limitations due to inherent technological limitations or unforeseen site-specific conditions. We will notify you of such limitations or conditions when they are identifiable.

We have enjoyed and appreciated this opportunity to have worked with you. If you have any questions, please do not hesitate to contact the undersigned.

Sincerely,

Robert J. Krause, PG
Senior Geophysicist

Quality Assurance/Control:

Matthew T. Bruckner, PG
Regional Director

Enclosures
Residential Well – Geophysical Logs and Planar Features
Appendix A: Planar Feature Orientation Parameters
Appendix B: Planar Feature Characterization
Appendix C: Wulff Plot

Z:\Shared\Projects\09630\0963003386 - SL - Washington Crossing Well Complaints\GP\Borehole Logging\121 Glenwood\deliverables\REPORT PIECES\121 Glenwood Borehole Logging Report 2025-03-06.docx

ENCLOSURES

Rettew Field Services

Geophysical Logging Program

WELL ID

Residential Well

Logging Date: *02/10/2025*

Logging Datum: *Top of Casing*

BOC: *29.8* **DTW:** *28.9* **TD:** *141.0*

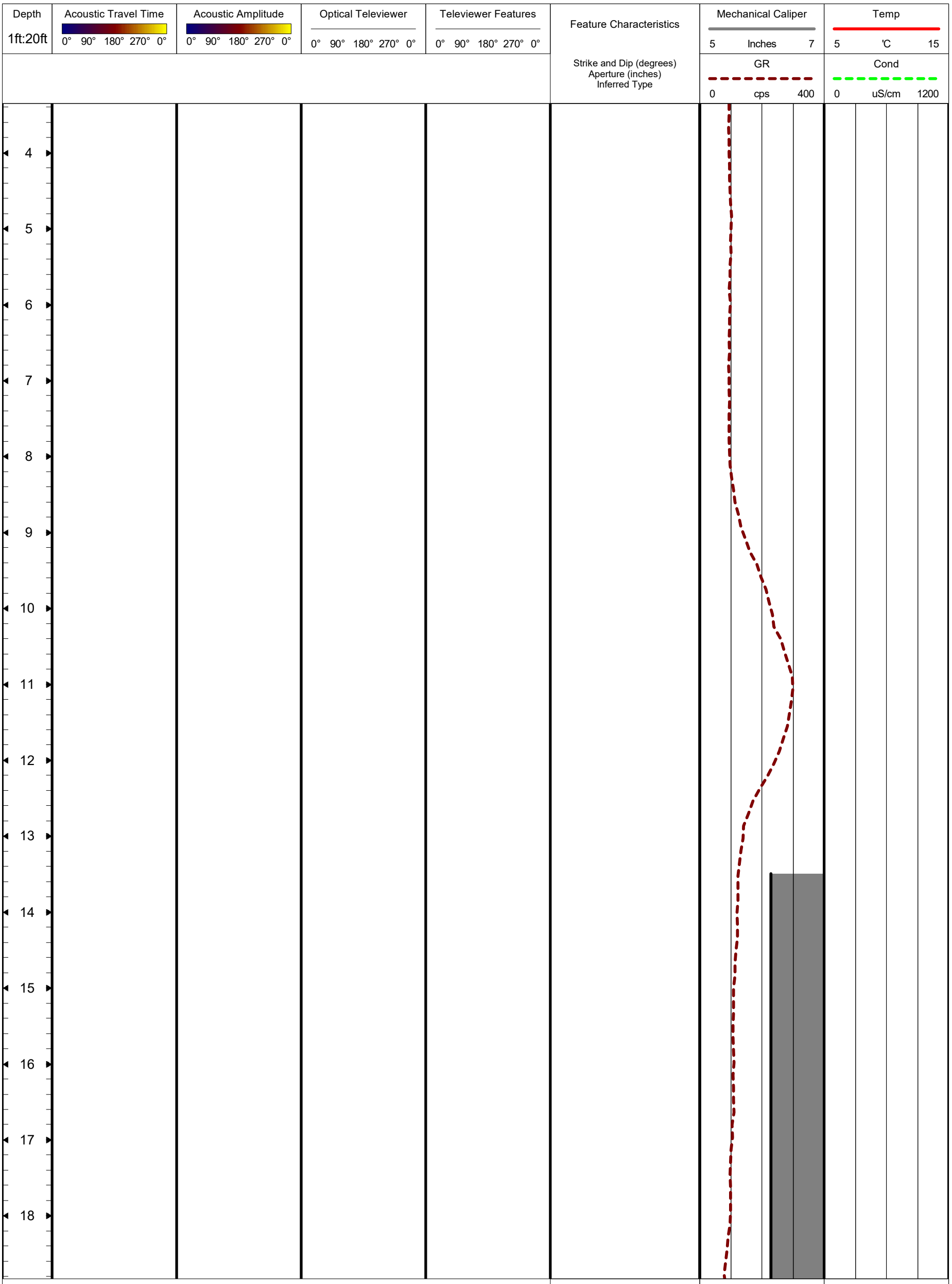
Site Name: *121 Glenwood*

Location: *Washington Crossing, PA*

Client: *Sunoco Pipeline, LLC*

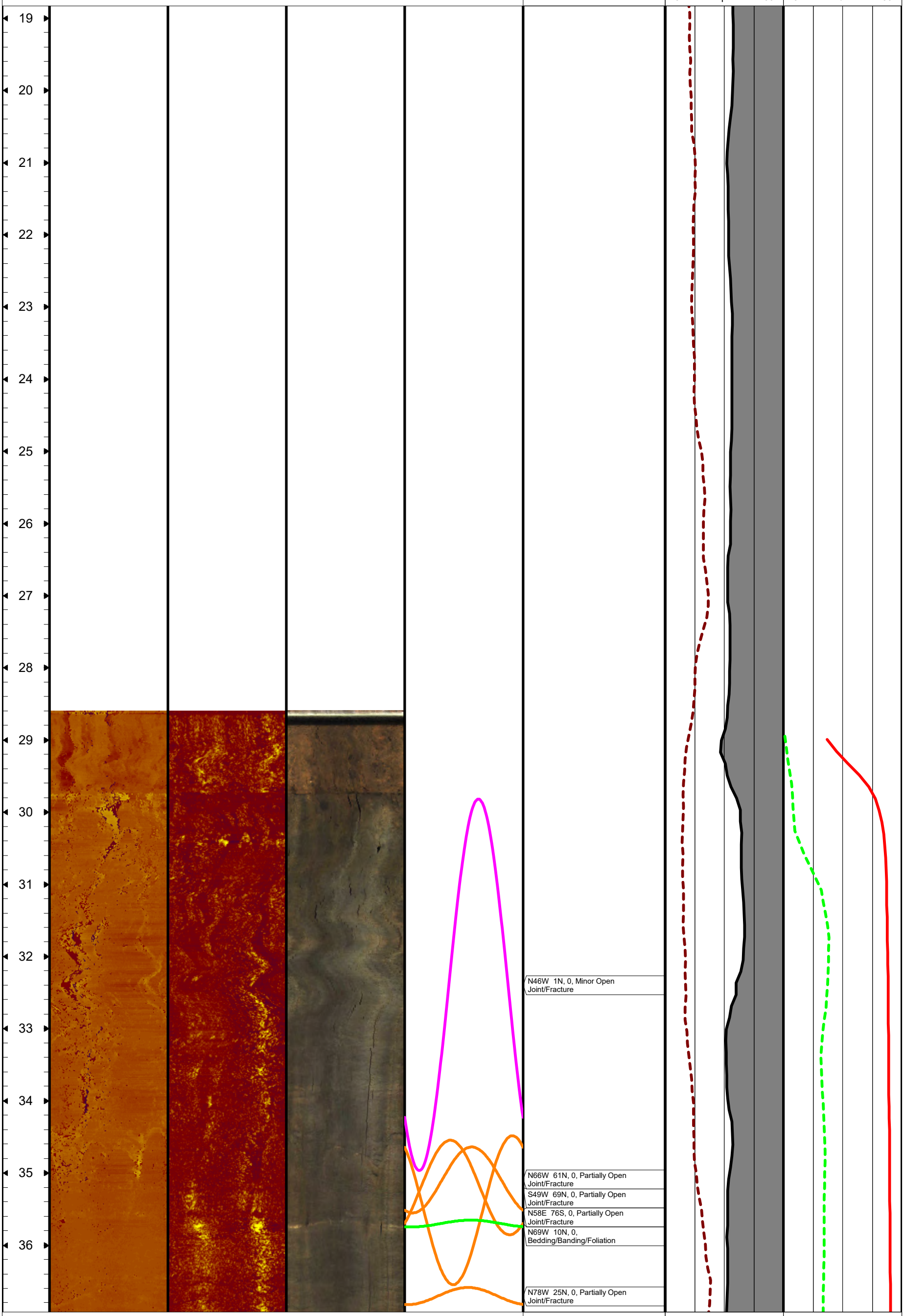
Project No.: *0963003386*

Revision Date: *02/12/2025*



Feature Characteristics
Strike and Dip (degrees)
Aperture (inches)
Inferred Type
GR
0 cps 400
Cond
0 uS/cm 1200
Depth
1ft:20ft
Acoustic Travel Time
0° 90° 180° 270° 0°
Acoustic Amplitude
0° 90° 180° 270° 0°
Optical Televiewer
0° 90° 180° 270° 0°
Televiewer Features
0° 90° 180° 270° 0°
Mechanical Caliper
5 Inches 7
Temp
5 'C 15

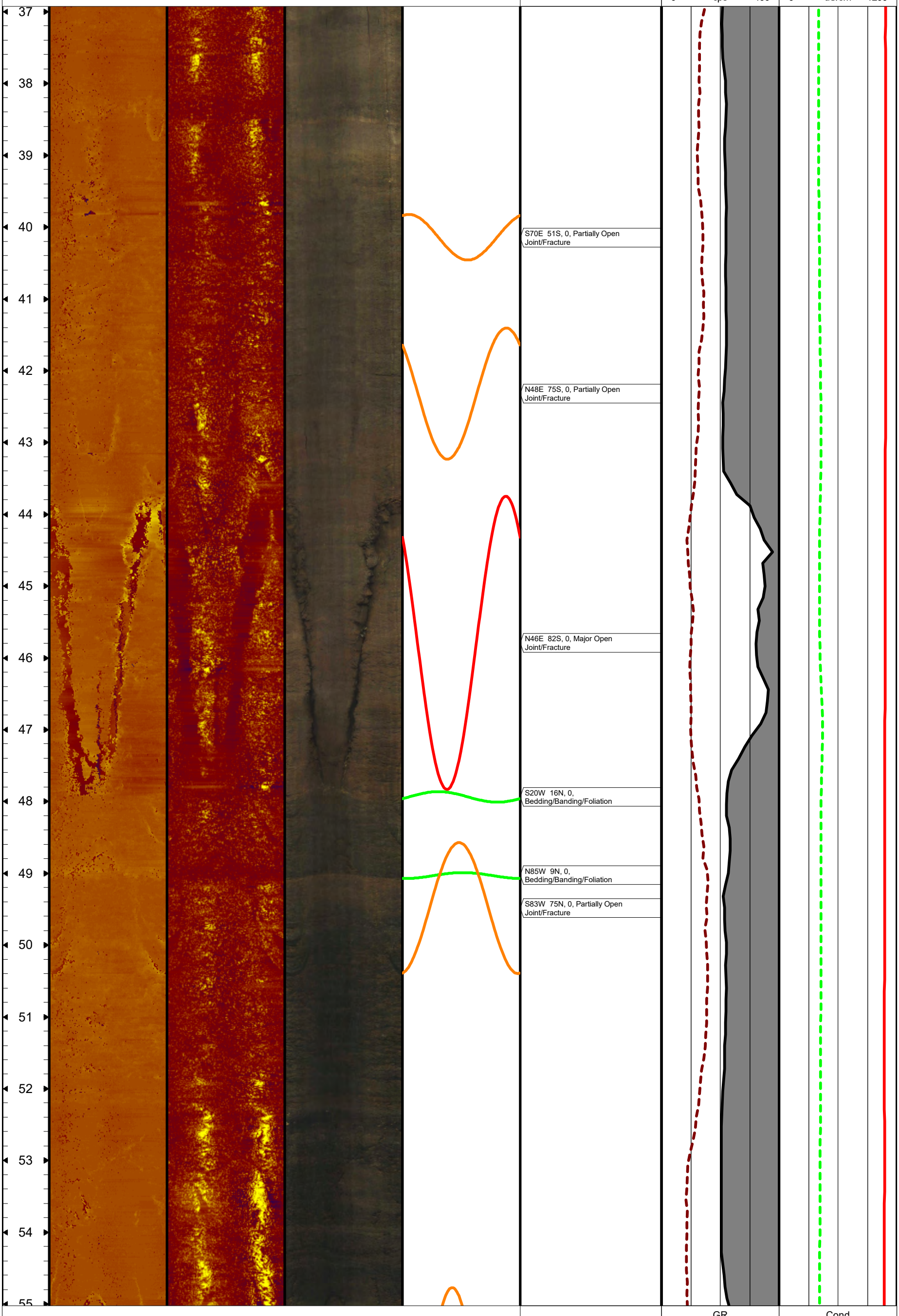
Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7 GR 0 cps 400	5 'C 15 Cond 0 uS/cm 1200



Feature Characteristics	GR	Cond
Strike and Dip (degrees) Aperture (inches) Inferred Type	0 cps 400	0 uS/cm 1200

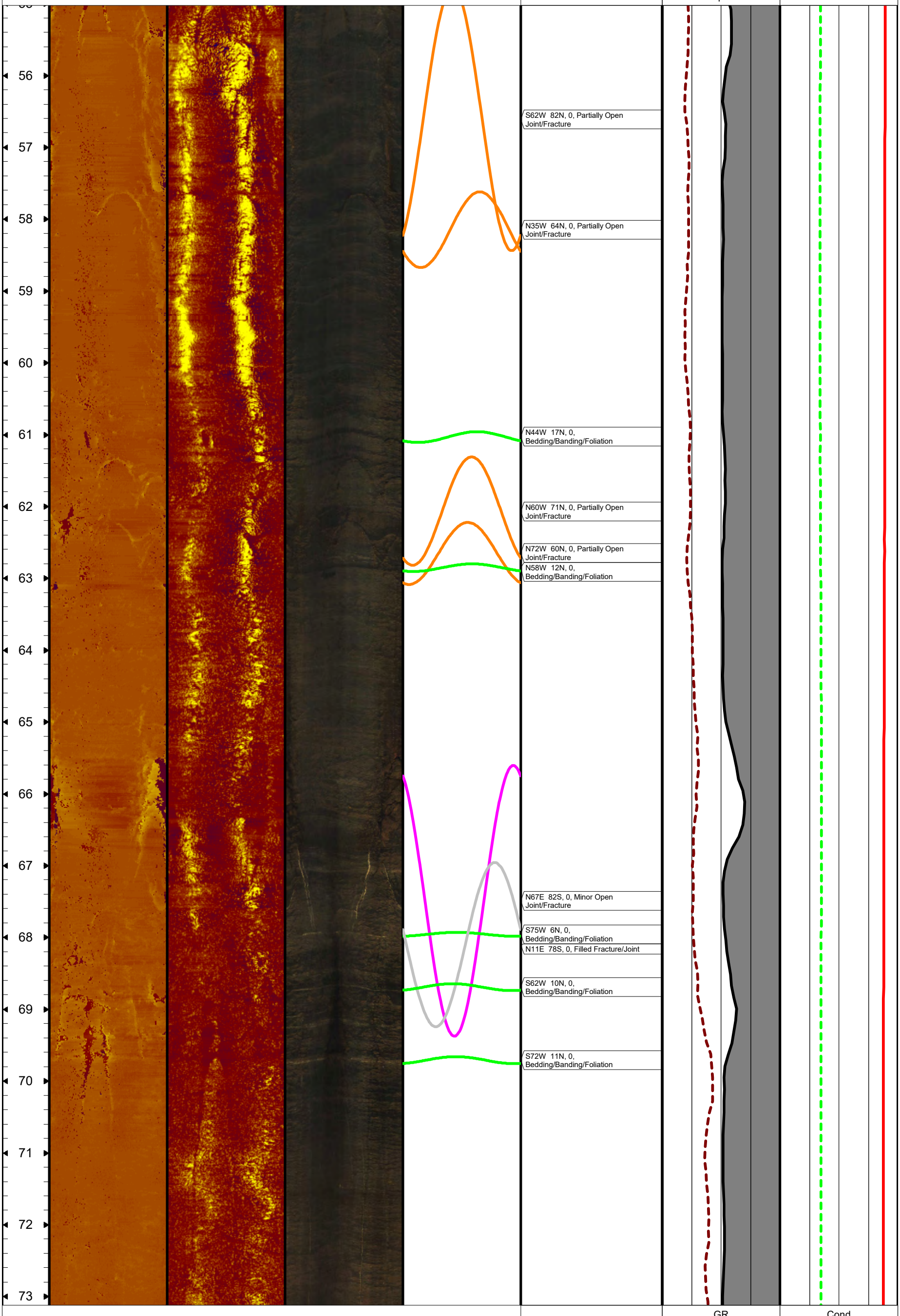
Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	5 Inches 7	5 'C 15

Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7	5 'C 15
						GR 0 cps 400	Cond 0 uS/cm 1200



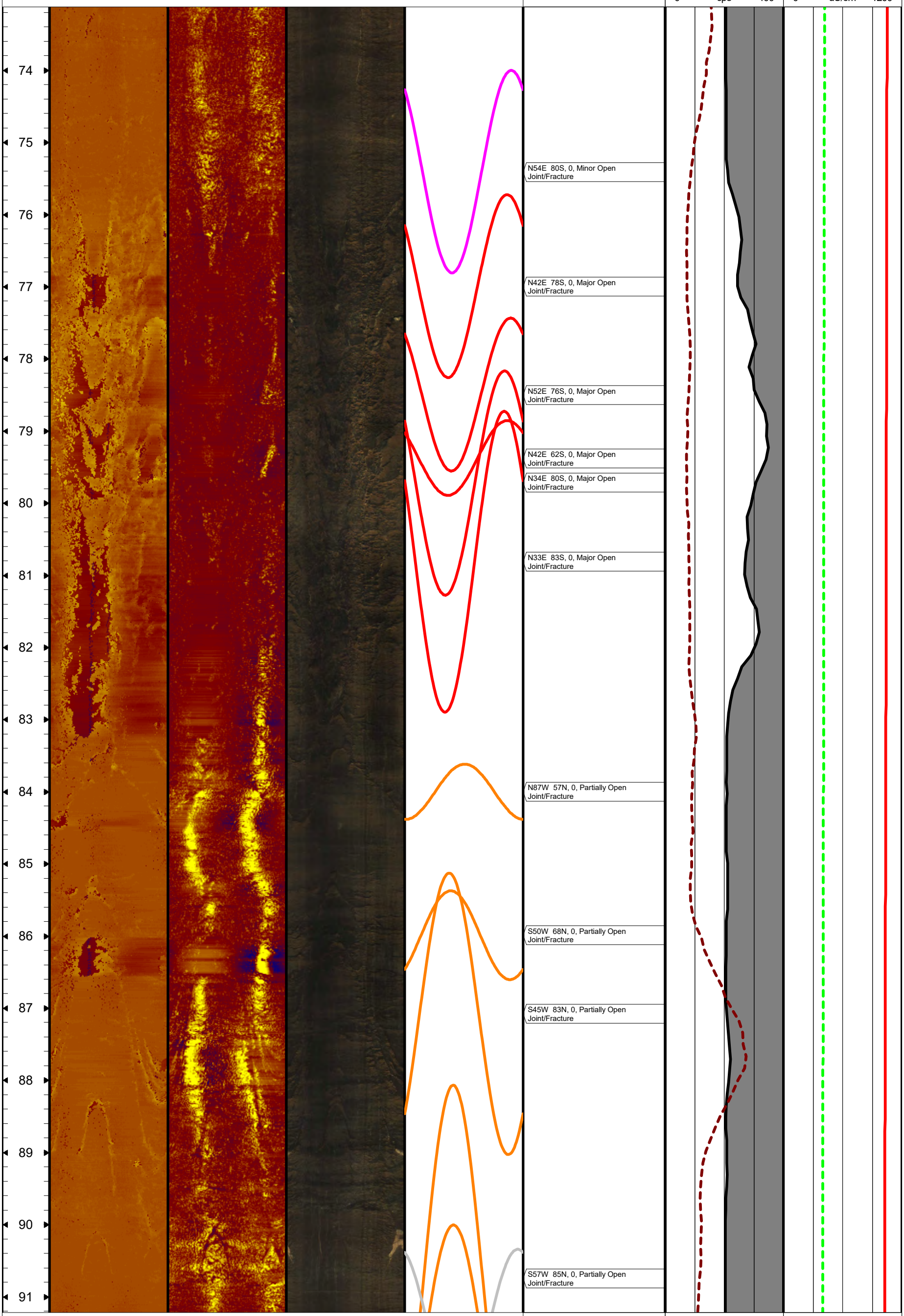
Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	GR	Cond	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	0 cps 400	0 uS/cm 1200	5 Inches 7	5 'C 15

Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7 GR 0 cps 400	5 'C 15 Cond 0 uS/cm 1200



Feature Characteristics	GR	Cond	Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Strike and Dip (degrees) Aperture (inches) Inferred Type	Mechanical Caliper	Temp
	0 cps 400	0 uS/cm 1200	1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°		5 Inches 7	5 'C 15

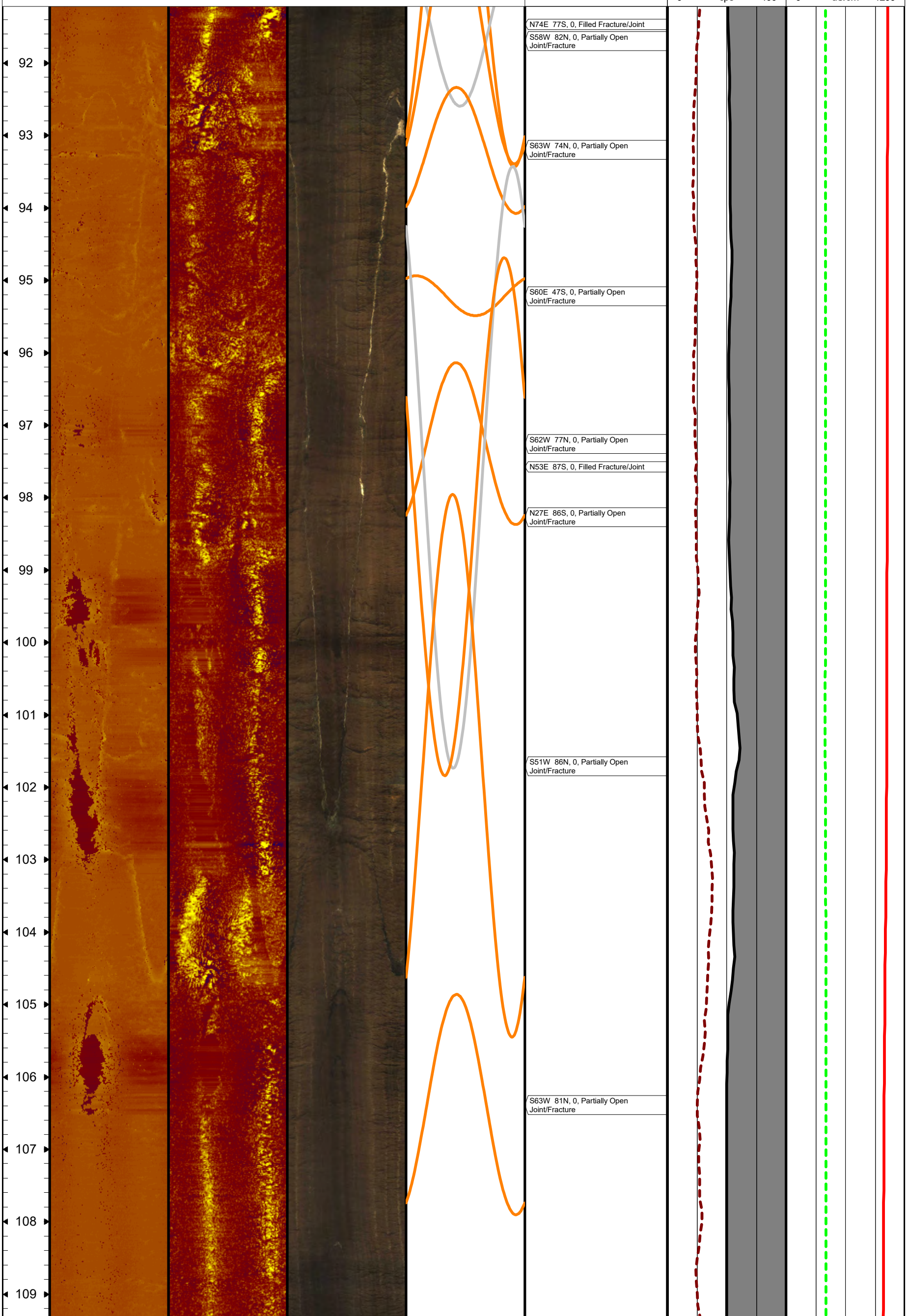
Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7 GR 0 cps 400	5 'C 15 Cond 0 uS/cm 1200



Feature Characteristics	GR	Cond
Strike and Dip (degrees) Aperture (inches) Inferred Type	0 cps 400	0 uS/cm 1200

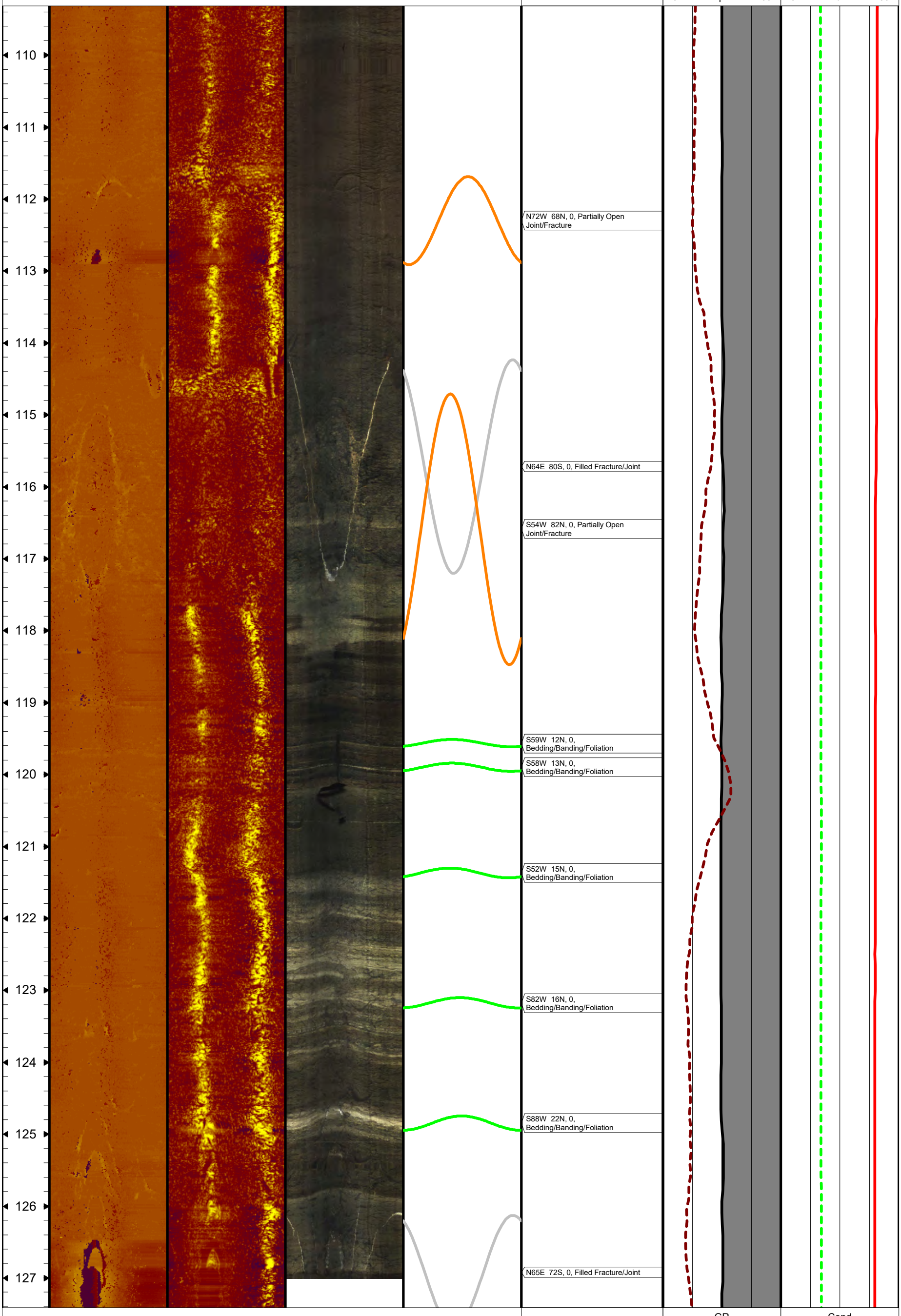
Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7	5 'C 15

Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7	5 'C 15
						GR 0 cps 400	Cond 0 uS/cm 1200



Feature Characteristics	GR	Cond	Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Mechanical Caliper	Temp
Strike and Dip (degrees) Aperture (inches) Inferred Type	0 cps 400	0 uS/cm 1200	1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	5 Inches 7	5 'C 15

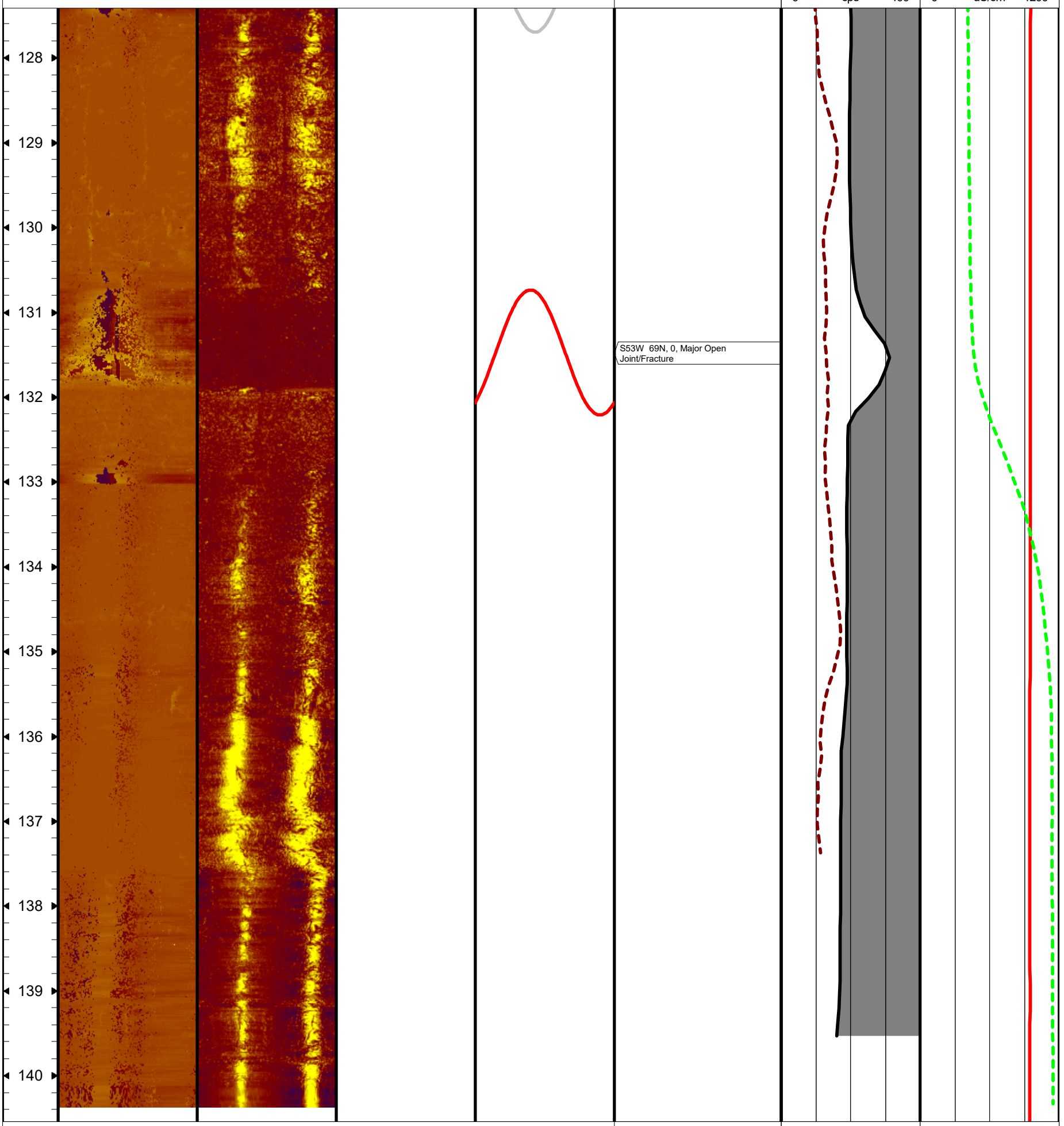
Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7 GR 0 cps 400	5 'C 15 Cond 0 uS/cm 1200



Feature Characteristics	GR	Cond
Strike and Dip (degrees) Aperture (inches) Inferred Type	0 cps 400	0 uS/cm 1200

Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7	5 'C 15

Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7	5 'C 15
						GR 0 cps 400	Cond 0 uS/cm 1200



Depth	Acoustic Travel Time	Acoustic Amplitude	Optical Televiewer	Televiewer Features	Feature Characteristics	Mechanical Caliper	Temp
1ft:20ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	Strike and Dip (degrees) Aperture (inches) Inferred Type	5 Inches 7	5 'C 15
						GR 0 cps 400	Cond 0 uS/cm 1200

APPENDIX A

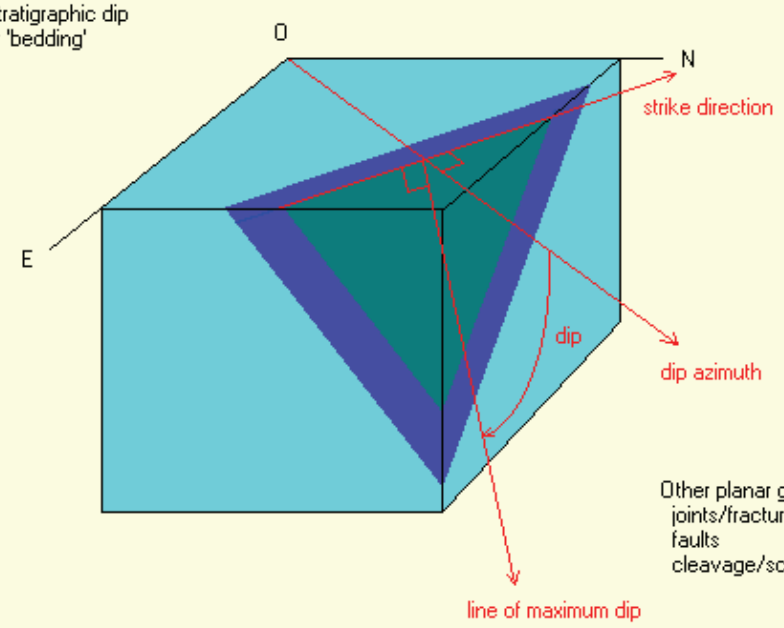
Planar Feature Orientation Schematic

Planar Feature Orientation Parameters

Dip = angle of inclination of the plane, downwards from the horizontal
Dip azimuth = azimuth of the line of maximum dip in the plane, clockwise from North
Strike direction = azimuth of a horizontal line in the plane (= dip azimuth – 90°)

e.g. dip and dip azimuth = 60° N041° or strike and dip = N311° 60°

e.g. Stratigraphic dip
or 'bedding'



Other planar geologic features include
joints/fractures/veins
faults
cleavage/schistosity

APPENDIX B

Planar Feature Characterization Table

Residential Well
Planar Feature Table

RETTEW

Project No.:	0963003386	**Client:**	Sunoco Pipeline, LLC
Site Name:	121 Glenwood Drive	**Logging Date:**	02/10/2025
Location:	Upper Makefield Twp, PA	**Revision Date:**	02/12/2025

Depth	Aperture (in.)	Dip Azimuth (deg.)	Strike (deg.)	Dip (deg.)	Feature Type
32.4	0.0	44	N46W	1N	Minor Open Joint/Fracture
35.1	0.0	24	N66W	61N	Partially Open Joint/Fracture
35.2	0.0	319	S49W	69N	Partially Open Joint/Fracture
35.5	0.0	148	N58E	76S	Partially Open Joint/Fracture
35.7	0.0	21	N69W	10N	Bedding/Banding/Foliation
36.7	0.0	12	N78W	25N	Partially Open Joint/Fracture
40.2	0.0	200	S70E	51S	Partially Open Joint/Fracture
42.3	0.0	138	N48E	75S	Partially Open Joint/Fracture
45.8	0.0	136	N46E	82S	Major Open Joint/Fracture
47.9	0.0	290	S20W	16N	Bedding/Banding/Foliation
49.0	0.0	5	N85W	9N	Bedding/Banding/Foliation
49.5	0.0	353	S83W	75N	Partially Open Joint/Fracture
56.6	0.0	332	S62W	82N	Partially Open Joint/Fracture
58.2	0.0	55	N35W	64N	Partially Open Joint/Fracture
61.0	0.0	46	N44W	17N	Bedding/Banding/Foliation
62.1	0.0	30	N60W	71N	Partially Open Joint/Fracture
62.7	0.0	18	N72W	60N	Partially Open Joint/Fracture
62.9	0.0	32	N58W	12N	Bedding/Banding/Foliation
67.5	0.0	157	N67E	82S	Minor Open Joint/Fracture
68.0	0.0	345	S75W	6N	Bedding/Banding/Foliation
68.1	0.0	101	N11E	78S	Filled Fracture/Joint
68.7	0.0	332	S62W	10N	Bedding/Banding/Foliation
69.7	0.0	342	S72W	11N	Bedding/Banding/Foliation
75.4	0.0	144	N54E	80S	Minor Open Joint/Fracture
77.0	0.0	132	N42E	78S	Major Open Joint/Fracture
78.5	0.0	142	N52E	76S	Major Open Joint/Fracture
79.4	0.0	132	N42E	62S	Major Open Joint/Fracture
79.7	0.0	124	N34E	80S	Major Open Joint/Fracture
80.8	0.0	123	N33E	83S	Major Open Joint/Fracture
84.0	0.0	3	N87W	57N	Partially Open Joint/Fracture
86.0	0.0	320	S50W	68N	Partially Open Joint/Fracture
87.1	0.0	315	S45W	83N	Partially Open Joint/Fracture
90.8	0.0	327	S57W	85N	Partially Open Joint/Fracture
91.5	0.0	164	N74E	77S	Filled Fracture/Joint
91.7	0.0	328	S58W	82N	Partially Open Joint/Fracture
93.2	0.0	333	S63W	74N	Partially Open Joint/Fracture
95.2	0.0	210	S60E	47S	Partially Open Joint/Fracture
97.3	0.0	332	S62W	77N	Partially Open Joint/Fracture
97.6	0.0	143	N53E	87S	Filled Fracture/Joint
98.3	0.0	117	N27E	86S	Partially Open Joint/Fracture
101.7	0.0	321	S51W	86N	Partially Open Joint/Fracture
106.4	0.0	333	S63W	81N	Partially Open Joint/Fracture
112.3	0.0	18	N72W	68N	Partially Open Joint/Fracture
115.7	0.0	154	N64E	80S	Filled Fracture/Joint
116.6	0.0	324	S54W	82N	Partially Open Joint/Fracture
119.6	0.0	329	S59W	12N	Bedding/Banding/Foliation
119.9	0.0	328	S58W	13N	Bedding/Banding/Foliation
121.4	0.0	322	S52W	15N	Bedding/Banding/Foliation
123.2	0.0	352	S82W	16N	Bedding/Banding/Foliation
124.9	0.0	358	S88W	22N	Bedding/Banding/Foliation
126.9	0.0	155	N65E	72S	Filled Fracture/Joint
131.5	0.0	323	S53W	69N	Major Open Joint/Fracture

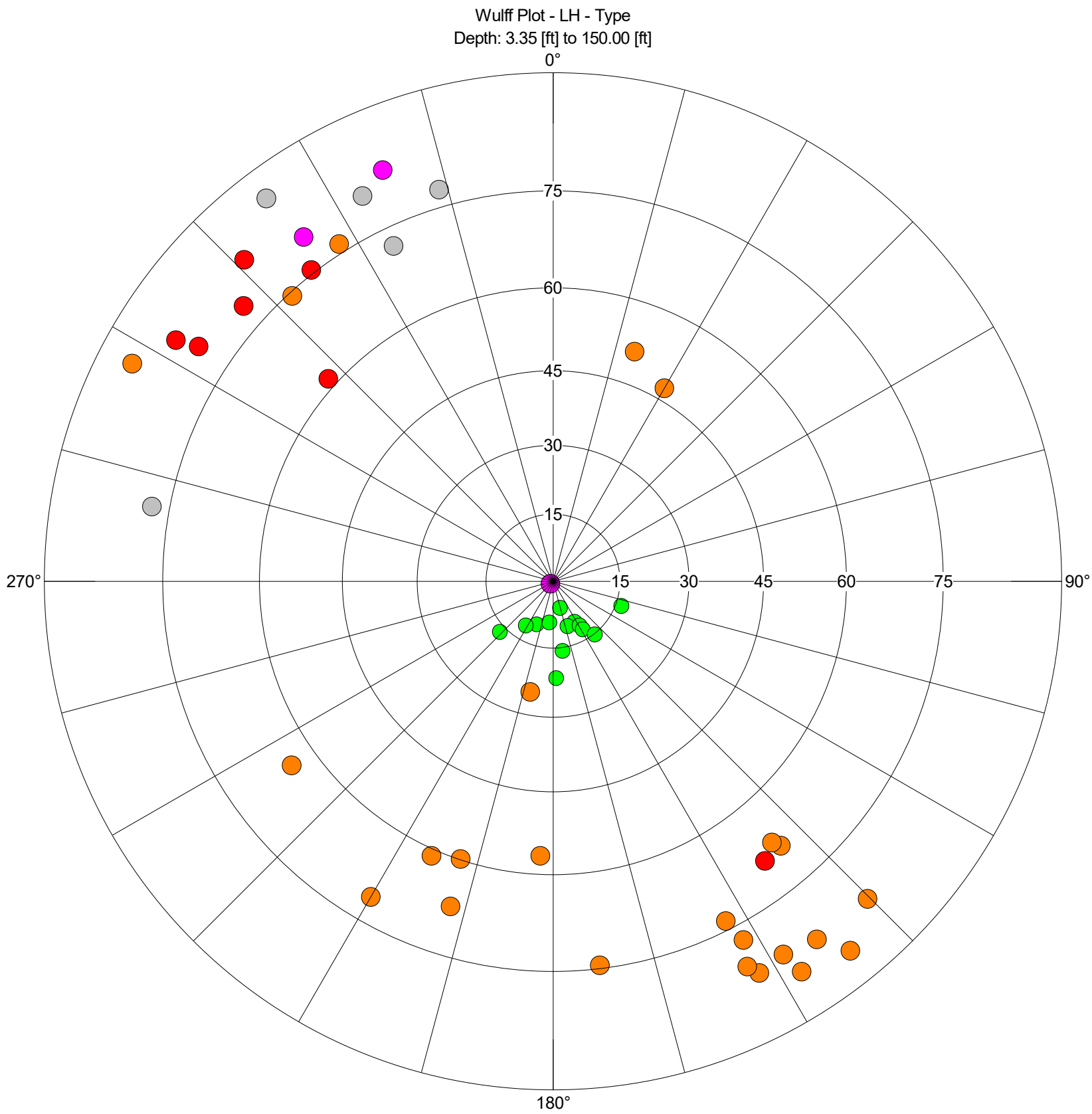
APPENDIX C

Planar Feature Wulff Plot

Rettew Field Services	WELL ID	Logging Date: 02/10/2025
Wulff Plot - LH-Type	Residential Well	Logging Datum: Top of Casing
		BOC: 29.8 DTW: 28.9 TD: 141.0

Site Name: *121 Glenwood*
Location: *Upper Makefield Township Washington Crossing, PA*
Client: *Sunoco Pipeline LP*
Project No.: *0963003386*
Revision Date: *02/25/2025*

Polar Projection - Dip



	Counts	Dip[deg]	Azi[deg]
Mean	52	74.98	330.83
	3	72.86	150.62
	24	77.36	338.49
	13	11.16	348.92
	7	80.99	132.72
	5	78.26	146.12

Polar Projection - Dip

Attachment 4

BCDH#		MUN		YEAR		SERIAL		
	W	4	7	2	5	0	8	3

Official use only
Owner ☐ Township ☐ Well driller ☐

Bucks County Department of Health

7321 New Falls Road, Levittown, PA 19055 – Phone: 267-580-3510 – Fax: 215-949-5819
1282 Almshouse Road, Doylestown PA 18901 – Phone: 215-345-3336 – Fax 215-340-8456
261 California Road, Quakertown, PA 18951 - Phone: 215-529-7000 – Fax: 215-529-7032

APPLICATION TO CONSTRUCT/MODIFY ALL WELLS

Well Owner: Sunoco Pipeline L.P.

Mailing Address: 100 Green Street
Marcus Hook, PA 19061

Telephone #: 610-859-6297

Email address: BRADFORD.FISH@energytransfer.com

Site Address: Glenwood Drive (Street)
Washington Crossing (Post Office) PA (State) 18977 (Zip)
MT EYRE MANOR (Subdivision Name) NA (Lot #)
Upper Makefield Township (Municipality)

Tax Parcel # 47-027-050+ 051

Application Fee Required $ NA DEP REQUIRED **Date Received** _____
*(See current fee schedule)

Send copy/response to consultant/driller? Yes ☑ No ☐

Well Driller Company: Parratt-Wolff, Inc.
License # 2186

Type of Well Construction	Geothermal Wells	Method of Sewage Disposal
☐ New Well	☐ Open Loop	☐ Public ☐ On-Site
☐ Deepen Existing Well	☐ Closed Loop	If on-site Sewage Permit #
☐ Hydrofracturing	# of Holes	Date Issued
☐ Abandoned	☑ Monitoring Wells	Date Finalized
☐ Other (specify)	# of Holes 3	

Plot Plan

Note: 4 copies of plot plan must accompany this application and be to a scale of 1" = 50' (minimum) on 8 ½" x 11" paper (minimum size).
Note: For new or modified drinking water well construction a RESIDENTIAL WELL WORKSHEET SA-131 must be filed and approved by Bucks County Department of Health BEFORE the water can be used for consumption.

Directions to Drilling Site:
The monitoring wells will be located in the Upper Makefield Township right-of-way of Glenwood Drive, Washington Crossing, PA.
The monitoring wells will be located northeast of 121 Glenwood Drive (47-027-049) and east of 123 Glenwood Drive (47-027-051).

Owner Declaration: I certify that the location herein proposed is accessible and meets all isolation distances presented in BCDH Rules and Regulations Governing all Wells and their Construction Specifications.

Owner(s) Name: Joseph Massaro **Owner's Signature:** Joseph Massaro **Date** 4/14/2025

Original Signature Required / No Faxed Copies Will Be Accepted

For Department Use Only

Approval to Construct/Modify

BCDH Signature: Brendan O'Boyle **Date:** 4/14/25

Approval to use

Date: _____

By: _____

SA-130 (Rev. 12/2019)

Stantec

Legend

Approximate Utility Locations
- Communications
- Electric
- Underground Piping

● Proposed Recovery Well Locations

N

0 20 40 60 Feet
(At original document size of 11x17)
1 in = 60 feet

Notes
1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
2. Data Sources: Stantec
3. Background: USGS Topo Layers (TMN): USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State HIU; NOAA National Centers for Environmental Information. Data refreshed February, 2025.
Nearmap WMS Server:

Project Location
Upper Makefield Township,
Bucks County, PA

Prepared by GWC on 2025-04-10
TR Review by XXX on 2025-xx-xx
IR Review by XXX on 2025-xx-xx

Client/Project 195603566
Energy Transfer Marketing & Terminals L.P.
ET Washington Crossing

Figure No.
1

Title
Utilities Map

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Attachment 5

Pace Altoona
2019 Ninth Avenue
Altoona, PA 16602
(814) 946-4306

EPA Lab ID: PA01737

NELAP
PA 07-00062
VA 460212

State Certifications:
MD 275
WV WW/SCM 364
WV DW 9963 CM

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40 Hoover Avenue
DuBois, PA 15801
(814) 371-6030

EPA Lab ID: PA01735

PA DEP Chapter 252
PA 33-00258

Pace Erie
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Erie, PA 16510
(814) 315-4343

EPA Lab ID: PA01736

NELAP
PA 25-05907
NY 12175

Pace Wysox
1851 Golden Mile Road
Wysox, PA 18854
(570) 265-5040

EPA Lab ID: PA01733

NELAP
PA 08-05622
NY 12127

Parratt Wolff, Inc.
51 Byers Ln
Watsontown, PA 17777

Project Manager: Josh Ellingworth

Project: New Shop

Project Number: [none]

Reported:
03/26/25 13:39

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Sample Type	Date Sampled	Date Received
Shop	AZC2931-01	Water	Grab	03/12/25 15:00	03/14/25 20:30
Well	AZC2931-02	Water	Grab	03/12/25 15:00	03/14/25 20:30

Pace Analytical Services, LLC

Reviewed and Submitted by:

Ron Bollman
Project Manager

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51 Byers Ln
Watsontown, PA 17777

Project: New Shop
Project Number: [none]

Project Manager: Josh Ellingworth

Reported:
03/26/25 13:39

Client Sample ID: **Shop**

Date/Time Sampled: 03/12/25 15:00

Laboratory Sample ID: **AZC2931-01 (Water/Grab)**

Analyte	Result	MDL	RL	Units	Date / Time Analyzed	Analytical Method	* Analyst	Note
Metals by Prep Method EPA 200.7								
Lead, Dissolved	<0.00800		0.00800	mg/l	03/19/25 10:38	EPA 200.7/4.4	rjd	X
Volatile Organic Compounds by EPA Method 8260B/Prep Method 5030B								
1,2,4-Trimethylbenzene	<1.00		1.00	ug/l	03/22/25 08:27	EPA 8260B -	stg	A4
1,3,5-Trimethylbenzene	<1.00		1.00	ug/l	03/22/25 08:27	EPA 8260B -	stg	A4
Benzene	<1.00		1.00	ug/l	03/22/25 08:27	EPA 8260B -	stg	A4
Ethylbenzene	<1.00		1.00	ug/l	03/22/25 08:27	EPA 8260B -	stg	A4
Isopropylbenzene	<1.00		1.00	ug/l	03/22/25 08:27	EPA 8260B -	stg	A4
Methyl tert-butyl ether	<1.00		1.00	ug/l	03/22/25 08:27	EPA 8260B -	stg	A4
Naphthalene	<1.00		1.00	ug/l	03/22/25 08:27	EPA 8260B -	stg	A4
Toluene	<1.00		1.00	ug/l	03/22/25 08:27	EPA 8260B -	stg	A4
Xylenes (total)	<3.00		3.00	ug/l	03/22/25 08:27	EPA 8260B -	stg	A4
Surrogate: 1,2-Dichloroethane-d4		*99.5 %*	*70-130*		*03/22/25 08:27*	*EPA 8260B -*	stg	
Surrogate: 4-Bromofluorobenzene		*99.2 %*	*70-130*		*03/22/25 08:27*	*EPA 8260B -*	stg	
Surrogate: Fluorobenzene		*98.0 %*	*70-130*		*03/22/25 08:27*	*EPA 8260B -*	stg	

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51 Byers Ln
Watsontown, PA 17777

Project: New Shop
Project Number: [none]

Project Manager: Josh Ellingworth

Reported:
03/26/25 13:39

Client Sample ID: Well

Date/Time Sampled: 03/12/25 15:00

Laboratory Sample ID: AZC2931-02 (Water/Grab)

Analyte	Result	MDL	RL	Units	Date / Time Analyzed	Analytical Method	* Analyst	Note
Metals by Prep Method EPA 200.7								
Lead, Dissolved	<0.00800		0.00800	mg/l	03/19/25 10:42	EPA 200.7/4.4	rjd	X
Volatile Organic Compounds by EPA Method 8260B/Prep Method 5030B								
1,2,4-Trimethylbenzene	<1.00		1.00	ug/l	03/22/25 08:53	EPA 8260B -	stg	A4
1,3,5-Trimethylbenzene	<1.00		1.00	ug/l	03/22/25 08:53	EPA 8260B -	stg	A4
Benzene	<1.00		1.00	ug/l	03/22/25 08:53	EPA 8260B -	stg	A4
Ethylbenzene	<1.00		1.00	ug/l	03/22/25 08:53	EPA 8260B -	stg	A4
Isopropylbenzene	<1.00		1.00	ug/l	03/22/25 08:53	EPA 8260B -	stg	A4
Methyl tert-butyl ether	<1.00		1.00	ug/l	03/22/25 08:53	EPA 8260B -	stg	A4
Naphthalene	<1.00		1.00	ug/l	03/22/25 08:53	EPA 8260B -	stg	A4
Toluene	1.13		1.00	ug/l	03/22/25 08:53	EPA 8260B -	stg	A4
Xylenes (total)	<3.00		3.00	ug/l	03/22/25 08:53	EPA 8260B -	stg	A4
Surrogate: 1,2-Dichloroethane-d4		*98.9 %*	*70-130*		*03/22/25 08:53*	*EPA 8260B -*	stg	
Surrogate: 4-Bromofluorobenzene		*98.2 %*	*70-130*		*03/22/25 08:53*	*EPA 8260B -*	stg	
Surrogate: Fluorobenzene		*96.9 %*	*70-130*		*03/22/25 08:53*	*EPA 8260B -*	stg	

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Watsontown, PA 17777

Project: New Shop
Project Number: [none]

Project Manager: Josh Ellingworth

Reported:
03/26/25 13:39

Notes

A4	Sample analysis was performed from a container containing head space.
X	Sample for dissolved metal analysis was not filtered within 15 minutes of collection. Sample was filtered and preserved at the laboratory.

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Project: New Shop
Project Number: [none]

Project Manager: Josh Ellingworth

Reported:
03/26/25 13:39

Definitions:

If surrogate values are not within the indicated range, then the results are considered to be estimated.

Reporting limits are adjusted accordingly when samples are analyzed at a dilution due to the matrix.

\+ MBAS, calculated as LAS, mol wt 348

If the solid sample weight for VOC analysis does not fall within the 3.5-6.5 gram range, the results are considered estimated values.

Unless otherwise noted, all results for solids are reported on a dry weight basis.

Samples collected by Pace Labs' personnel are done so in accordance with Standard Operating Procedures established by Pace Labs.

\# The following analyses are to be performed immediately upon sampling: pH, sulfite, chlorine residual, dissolved oxygen, filtration for ortho phosphorus, and ferrous iron. The date and time reported reflect the time the samples were analyzed at the laboratory; and should be considered as analyzed outside the EPA holding time.

^ The following analytes are to be filtered immediately upon sampling: Hexavalent Chromium. Filtration through a 0.45 micron filter within 15 minutes of sampling is required for compliance with the Clean Water Act (CWA) for reporting of hexavalent chromium to prevent interconversion of chromium species.

* **Analysis location indicator:**
D: Indicates analysis performed by Pace Analytical Laboratories, LLC, 40 Hoover Ave., DuBois, PA 15801. PA DEP Chapter 252 certification: PA 33-00258.
E: Indicates analysis performed by Pace Analytical Laboratories, LLC, 1920 East 38th Street, Erie, PA 16510. NELAP certification: PA 25-05907.
W: Indicates analysis performed by Pace Analytical Laboratories, LLC, 1851 Golden Mile Rd., Wysox, PA 18854. NELAP certification: PA 08-05622 and NY 12127.

< Represents "less than" - indicates that the result was less than the RL, or the MDL if indicated for the parameter.

MDL Method Detection Limit - is the lowest or minimum level that provides 99% confidence level that the analyte is detected. Any reported result values that are less than the RL are considered estimated values. If Radiological results are reported, the MDC - Minimum Detectable Concentration is shown in the MDL column.

Definitions Continued:

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PA 08-05622
NY 12127

Parratt Wolff, Inc.
51 Byers Ln
Watsontown, PA 17777

Project: New Shop
Project Number: [none]

Project Manager: Josh Ellingworth

Reported:
03/26/25 13:39

RL	Reporting Limit - is the lowest or minimum level at which the analyte can be quantified.
[CALC]	Indicates a calculated result. Calculations use results from other analyses performed under accredited methods.
ND	Non Detect. The noted analyte was not detected in the sample.

(-) Method Revision Indicator - West Virginia Samples

CALC- : Indicates analysis by SM2340 B-2011. This method appears on the WV DEP List of Certified Parameters but the PA DEP does not offer accreditation for this method.
EPA 8270D - : Indicates that samples collected in West Virginia are analyzed by Method SW 8270E.
EPA 8260B - : Indicates that samples collected in West Virginia are analyzed by Method SW 8260D.
EPA 8015D - : Indicates that samples collected in West Virginia are analyzed by Method SW 8015C.
EPA 1010 - : Indicates that samples collected in West Virginia are analyzed by Method SW 1010B.
EPA 6010B - : Indicates that samples collected in West Virginia are analyzed by Method SW 6010D.

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40 Hoover Avenue
DuBois, PA 15801
(814) 371-6030

EPA Lab ID: PA01735

PA DEP Chapter 252
PA 33-00258

Pace Erie
1920 East 38th Street
Erie, PA 16510
(814) 315-4343

EPA Lab ID: PA01736

NELAP
PA 25-05907
NY 12175

Pace Wysox
1851 Golden Mile Road
Wysox, PA 18854
(570) 265-5040

EPA Lab ID: PA01733

NELAP
PA 08-05622
NY 12127

Parratt Wolff, Inc.
51 Byers Ln
Watsontown, PA 17777

Project: New Shop
Project Number: [none]

Project Manager: Josh Ellingworth

Reported:
03/26/25 13:39

Terms & Conditions

Services provided by Pace Analyitcal Services, LLC are limited to the terms and conditions stated herein, unless otherwise agreed to in a formal contract.

CHAIN OF CUSTODY Pace Analytical Services, LLC ("Pace", "us", or "we") will provide, upon client request, chain of custody forms for use.

CONFIDENTIALITY Pace maintains confidentiality in all of our client interactions. The client's consent will be required before releasing information about the services provided.

CONTRACTS All contracts are subject to review and approval by Pace's legal council. Each contract must be signed by a corporate officer.

PAYMENT/BILLING Unless otherwise set forth in a signed contract or purchase order, terms of payment are "NET 30 Days." The time allowed for payment shall begin based on the invoice date. A 1.5% per month service charge may be added to all unpaid balances beyond the initial 30 days. In its sole discretion, Pace reserves the right to request payment before services and hold sample results for payment of due balances. We will not bill a third party without prior agreement among all parties acknowledging and accepting responsibility for payment.

SAMPLE COLLECTION AND SUBMISSION Clients not requesting collection services from Pace are responsible for proper collection, preservation, packaging, and delivery of samples to the laboratory in accordance with current law and commercial practice. Pace shall have no responsibility for sample integrity prior to the receipt of the sample(s) and/or for any inaccuracy in test or analyses results as a result of the failure of the client or any third party to maintain the integrity of samples prior to delivery to Pace. All samples submitted must be accompanied by a completed chain of custody or similar document clearly noting the requested analyses, dates/time sampled, client contact information, and trail of custody. Samples received at the laboratory after business hours are verified on the next business day. Discrepancies are documented on the Receiving Document.

SUBCONTRACTING Some analyses may require subcontracting to another laboratory. Unless the client indicates otherwise, this decision will be made by Pace. Subcontracted work will be identified on the final report in accordance with NELAC requirements.

RETURN OF RESULTS Pace routinely provides verbal or email results within 10 working days of receipt of sample(s). If requested, a hard copy of the data results are routinely sent via US Postal Service within 10 working days. At the request of the client, Pace may offer expedited return of sample results. Surcharges may apply to rush requests. All rush requests must be pre-approved by Pace. Pace reserves the right to charge an archive retrieval fee for results older than one (1) year from the date of the request. All records will be maintained by Pace in accordance with their retention policy.

SAMPLE DISPOSAL Pace will maintain samples for four (4) weeks after the sample receipt date. Pace will dispose of samples which are not and/or do not contain hazardous wastes (as such term is defined by applicable federal or state law), unless prior arrangements have been made for long-term storage. Pace reserves the right to charge a disposal fee for the proper disposal of samples found or suspected to contain hazardous waste. A return shipping charge will be invoiced for samples returned to the client at their request.

HAZARD COMMUNICATION The client has the responsibility to inform the laboratory of any hazardous characteristics known or suspected about the sample, and to provide information on hazard prevention and personal protection as necessary or otherwise required by applicable law.

WARRANTY AND LIMITATION OF LIABILITY For services rendered, Pace warrants that it will apply its best scientific knowledge and judgment and to employ its best level of effort consistent with professional standards within the environmental testing industry in performing the analytical services requested by its clients. We disclaim any other warranties, expressed or implied by law. Pace does not accept any legal responsibility for the purposes for which client uses the test results.

LITIGATION All costs associated with compliance to any subpoena for documents, for testimony in a court of law, or for any other purpose relating to work performed by Pace Analyitcal Services, LLC shall be invoiced by Pace and paid by client. These costs shall include, but are not limited to, hourly charges for the persons involved, travel, mileage, and accommodations and for any and all other expenses associated with said litigation.

Pace Labs in Altoona, PA is a NELAP (National Environmental Laboratory Accreditation Program) accredited lab, and as such, certifies that all applicable test results meet the requirements of NELAP, unless otherwise stated on the analytical report.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

* New Client *

Pace® Location Requested (City/State):

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevant fields

AZC2931

Company Name: Parratt Wolff, Inc.	Contact/Report To: Josh Ellingworth
Street Address: 51 Byers Ln, Watsontown, PA 17777	Phone #: 570-523-8913
	E-Mail: jellingworth@pwinc.com
Customer Project #:	Cc E-Mail:
Project Name: New Shop	Invoice to:
Site Collection Info/Facility ID (as applicable):	Invoice E-mail:
	Purchase Order # (if applicable): AZC2931
Time Zone Collected: [ ] AK [ ] PT [ ] MT [ ] CT [ ] ET	Quote #:
Data Deliverables: [ ] Level II [ ] Level III [ ] Level IV [ ] EQUIS [ ] Other	County / State origin of sample(s):
	Regulatory Program (DW, RCRA, etc.) as applicable: Reportable [ ] Yes [ ] No
	Rush (Pre-approval required): [ ] Same Day [ ] 1 Day [ ] 2 Day [ ] 3 Day Other:
	Date Results Requested:
	DW PWSID # or WW Permit # as applicable:
	Field Filtered (if applicable): [ ] Yes [ ] No
	Analysis:

Specify Container Size **

Identify Container Preservative Type***

Analysis Requested

** Container Size: (1) 1L, (2) 500mL, (3) 250mL, (4) 125mL, (5) 100mL, (6) 40mL Vial, (7) EnCore, (8) TerraCore, (9) 90mL, (10) Other

*** Preservation Types: (1) None, (2) HNO3, (3) H2SO4, (4) HCl, (5) NaOH, (6) Zn Acetate, (7) NaHSO4, (8) Sod. Thiosulfate, (9) Ascorbic Acid, (10) MeOH, (11) Other

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SS), Oil (OL), Wipe (WP), Tissue (TS), Bioassay (B), Vapor (V), Surface Water (SW), Sediment (SED), Sludge (SL), Caulk (CK), Leachate (LL), Biosolid (BS), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Composite Start Date	Composite Start Time	Collected or Composite End Date	Collected or Composite End Time	# Cont.	Residual Chlorine Result	Residual Chlorine Units	Sample Comment
01- Shop		G			3/12/25	3:00pm				0°C
02- Well		G			3/12/25	3:00pm				.4°C

Lab Use Only: Proj. Mgr: / Acct.Num / Client ID: / Table #: / Profile / Template: / Prelog / Bottle Ord. ID:

Preservation non conformance identified for sample.

Additional Instructions from Pace® :

Collected By: Printed Name: Valyn Ellingworth

Signature: Valyn Ellingworth

Customer Remarks / Special Conditions / Possible Hazards:

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
Valyn Ellingworth / Parratt Wolff	3/14/25 0946		3-14-25 946
Relinquished by/Company: (Signature)	Date/Time: 3-14-25 1425	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time: 3/14/25 1830
Relinquished by/Company: (Signature)	Date/Time: 3-14-25 2030	Received by/Company: (Signature)	Date/Time: 3/14/25 2030

Coolers: 1 | Thermometer ID: R612 | Correction Factor (°C): | Obs. Temp. (°C): | Corrected Temp (°C): | [ ] On ice

Tracking Number:

Delivered by: [ ] In-Person [ ] Courier [ ] FedEX [ ] UPS [ ] Other

Page: 1 of 2

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace® Terms and Conditions found at https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

SAMPLE CONDITION UPON RECEIPT (SCUR)

CLIENT	Pacraft Wolff	WORK ORDER	AZL29931
DATE	3/17/25	TIME	8:46
INITIALS	JLW	PAGE	2 OF 3
RECEIVED TEMP (C°)	0.4	WERE TEMPS ACCEPTABLE BASED ON SAMPLE DATE/TIME?	(Y) N
RECEIVED ON ICE?	(Y) N	IF NO, EXPLAIN: CLIENT NOTIFICATION REQUIRED	
AM TEMP GUN ID	2416		
AM TEMP <6°C	(Y) N NA	WATER TEMPS SHOULD BE ABOVE FREEZING TO 6.0°C ~FOR PA SAMPLES: >6°C OK WHEN COLLECTED SAME CALENDAR DAY AS RECEIPT, WHEN ON ICE, WITH EVIDENCE OF COOLING~	
CUSTODY SEALS?	Y (N) NA		
SEALS INTACT?	Y N (NA)		

CHAIN OF CUSTODY (COC)

DID COC ACCOMPANY SAMPLES?	(Y) N	SAMPLE LOCATION/DESCRIPTION/ID?	(Y) N
IF NO TO ANY QUESTION, COC IS INCOMPLETE AND REQUIRES ATTENTION!		NAME or INITIALS of SAMPLE COLLECTOR?	(Y) N
IF PWS, DOES COC CONTAIN:		COMPLETE DATES/TIMES ?	(Y) N
7-DIGIT PWS ID?	Y N	GRAB/COMPOSITE NOTED?	(Y) N
PWS SAMPLE ID?	Y N	RELINQUISHED SIGNATURE?	(Y) N
CONTACT NAME?	Y N ON RECORD	RECEIVED SIGNATURE?	(Y) N
CONTACT NUMBER?	Y N ON RECORD	#NUMBER OF CONTAINERS PER SAMPLE?	Y (N)
IS SAMPLE REPORTABLE?	Y N	#PRESERVATION TYPE(S)?	Y (N)
7-DIGIT PWS ID & PWS SAMPLE ID MUST BE RECORDED ON COC		# If the COC does not list the containers/preservative received for each sample, fill out page 2 of this document. If page 2 is not required, it will not be included as part of the sample record.	

BOTTLEWARE & PRESERVATION

SAMPLE BOTTLES INTACT?	(Y) N	IF NO, EXPLAIN:	
SAMPLE LABELS MATCH COC? (ID, DATE, TIME)	(Y) N	IF NO, EXPLAIN:	
CORRECT CONTAINERS?	(Y) N	IF NO, EXPLAIN:	
ADEQUATE VOLUME OF SAMPLE PROVIDED?	(Y) N	IF NO, EXPLAIN:	
HEADSPACE? (Volatiles, Odor, Ignitability, Sulfide)	(Y) N NA	FIELD FILTERED? (Dissolved Analyses, Hex Cr, Ortho-Phos)	Y N (NA)
TRIP BLANKS? (Required for 524.2 Volatiles, EDB/DBCP)	Y N (NA)		
ALL CONTAINER PRESERVATION MEETS REQUIREMENTS?	Y N (NA)	IF NO, EXPLAIN:	

PRESERVATION CHECKED		DATE	TIME	INITIALS
PRESERVATION ADDED	_____ mL Added	DATE	TIME	INITIALS

PRESERVATIVE:	ELEMENT ID:	pH STRIPS ELEMENT ID

SAMPLES LABELED BY	DATE 3/17/25
INITIALS TT	TIME 14:00

CLIENT NOTIFICATION

FILL OUT THE FOLLOWING:

DATE/TIME	REASON FOR CONTACT: All vials have large amount of headspace
PAS-ALTOONA EMPLOYEE	OUTCOME OF DISCUSSION
PERSON CONTACTED	ADDITIONAL NOTES: Added analysis from PM's email.
CIRCLE METHOD: PHONE / EMAIL / OTHER	

SAMPLE CONDITION UPON RECEIPT (SCUR)

CLIENT	Parratt Wolff	WORK ORDER	42C39931	PAGE	3 OF 3
INITIALS	JW	DATE	3-17-24	TIME	830

If the COC does not list the containers/preservative received for each sample, record below.

Possible Container Preservatives (NP = Not Preserved)

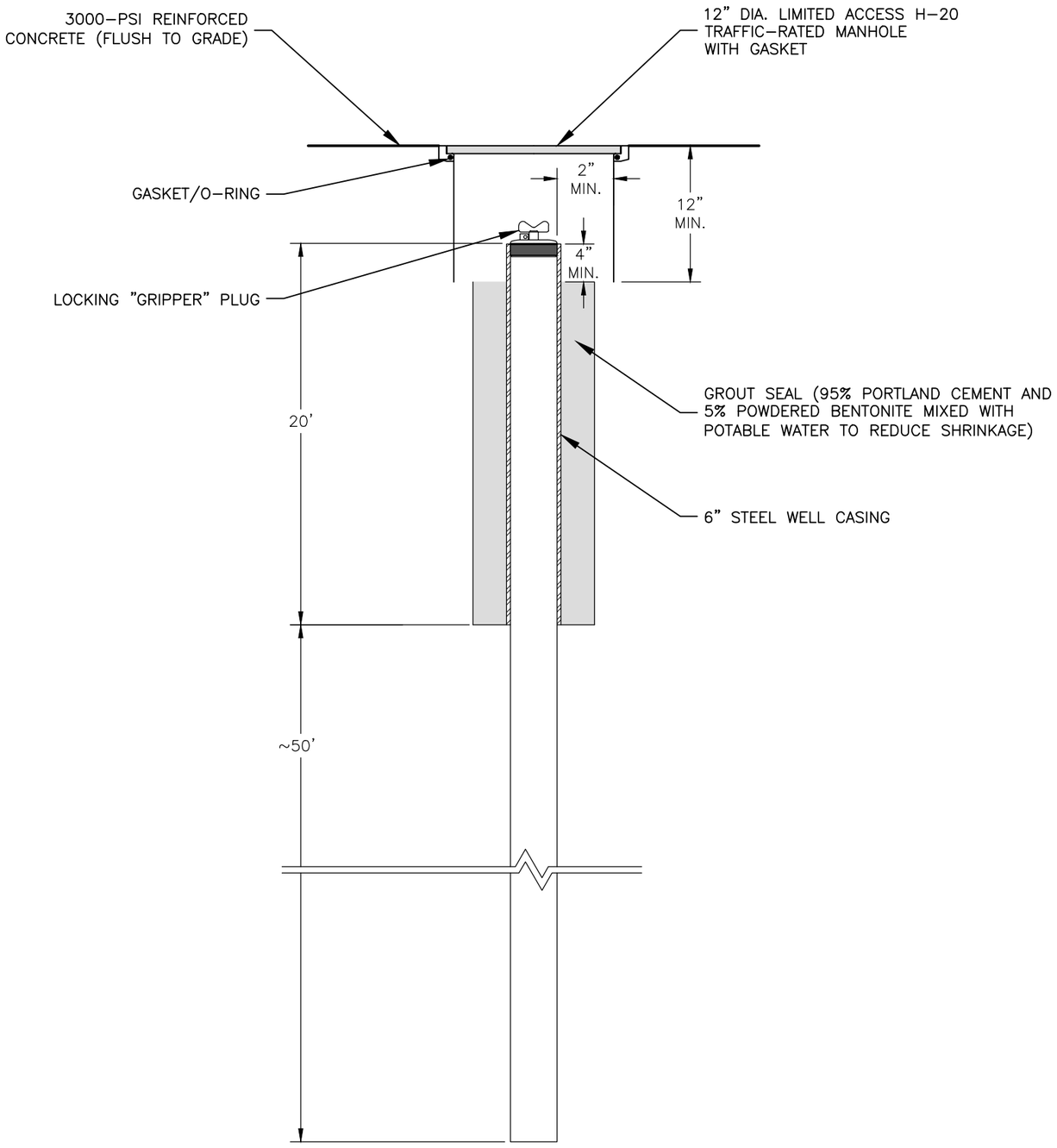
HCl	Hydrochloric Acid	HNO_3	Nitric Acid	$Na_2S_2O_3$	Sodium Thiosulfate
$C_6H_8O_6$	Ascorbic Acid	EDA	Ethylenediamine	$NaHSO_4$	Sodium Bisulfate
ZnAce	Zinc Acetate	NaOH	Sodium Hydroxide	$(NH_4)_2SO_4$	Ammonium Sulfate Buffer
MeOH	Methanol	NH_4Cl	Ammonium Chloride	H_2SO_4	Sulfuric Acid

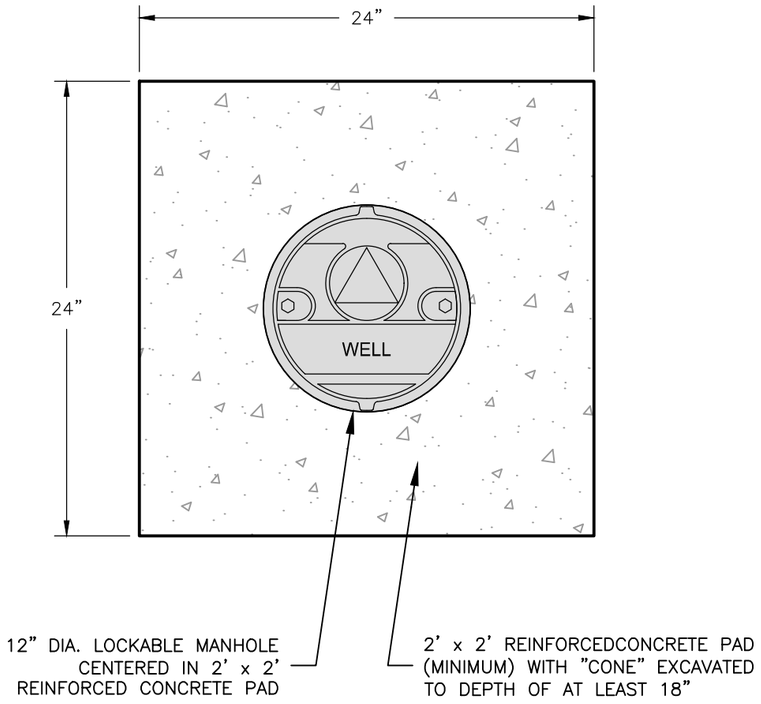
Possible Container Materials/Types	***Possible Container Sizes***
P - Plastic, AG - Amber, G - Glass, B - Baggie, C - Cubitainer, O - Other (OTHER MUST BE SPECIFIED)	1gal, 120mL (Bacti), 125mL, 1L, 2oz, 2.5gal, 250mL, 300mL, 32oz, 4oz, 40mL (Vial), 5gal, 500mL, 8oz

IF USED, SAMPLE FRACTION MUST ALSO BE RECORDED ON COC — ADD ONE CONTAINER TYPE PER LINE

Sample Fraction	Sample Description	Container Type	Container Size MUST CONTAIN UNITS	Preservative(s)	# of Type Received	Comments
	01	P	250-1	NP	1	
	through	G	40-1	$Na_2S_2O_3$	2	
	02	G	40-1	HCL	3	

Attachment 6





Typical Construction
6-Inch Recovery Well Flush Mount

Sunoco Pipeline
Upper Makefield Township,
Washington Crossing, Pennsylvania

Drawn	Date
E.V.	05/05/25
Designed	Figure
G.R.	
Approved	
R.K.E.	

Not to Scale

Groundwater & Environmental Services, Inc.

N:\Graphics\Graphics\Exton\Sunoco\Sun Pipe Line\Washington Crossing\Engineering\Washington Crossing Well Head Detail.dwg, Flush-02, EVega, 1:1

Attachment 7

UPPER MAKEFIELD RESPONSE
WASHINGTON CROSSING, PENNSYLVANIA

AIR AND NOISE MONITORING PLAN FOR RECOVERY WELL INSTALLATION

Version 1.2

Prepared on Behalf of:
Sunoco Pipeline LP

Prepared By:
CTEH, LLC
5120 Northshore Drive
Little Rock, AR 72118

April 21, 2025

	NAME/ORGANIZATION	SIGNATURE	DATE SIGNED
v1.0 Prepared by:	Sarah Burnett, PhD, CTEH		3/8/2025
v1.1 Prepared by:	Sarah Burnett, PhD, CTEH		4/3/2025
v1.2 Prepared by:	Sarah Burnett, PhD, CTEH		4/21/2025
Approved by:			
Approved by:			

1.0 Introduction and Purpose

This Air and Noise Monitoring Plan for Recovery Well Installation (hereinafter referred to as Plan) was prepared by CTEH, LLC (CTEH) on behalf of Sunoco Pipeline LP (Sunoco Pipeline) in relation to the Upper Makefield Response in Washington Crossing, Pennsylvania. A release from a pipeline that transports refined petroleum products, including jet fuel, was identified in January 2025. The GPS coordinates for the approximate location of the release site (hereinafter referred to as Site) are: 40.271184, -74.875953. A map of the incident location is provided in **Attachment A**.

This Plan outlines a strategy for outdoor air monitoring and sampling and noise monitoring that will be implemented during the installation of recovery wells at properties and/or in public areas in the Mt. Eyre Manor neighborhood in Washington Crossing, Pennsylvania (hereinafter referred to as Properties). Air monitoring and sampling and noise monitoring will generally occur along the perimeter of the Properties, primarily between the area where recovery well installation activities will occur (the work area) and nearby residences.

The objectives of this monitoring and sampling program are to:

1. Conduct real-time air monitoring along the perimeter of the Properties to evaluate potential impacts to outdoor air related to recovery well installation;
2. Collect outdoor air samples at four discrete locations along the perimeter of the Properties to further evaluate potential impacts to outdoor air related to recovery well installation; and
3. Conduct noise monitoring along the perimeter of the Properties to evaluate potential impacts to noise levels related to recovery well installation.

2.0 Health and Safety

Field personnel will review and adhere to the site-specific Health and Safety Plan (HASP). Sampling and field activities will only be conducted under weather and other conditions that do not create an unsafe working environment.

3.0 Data Quality Objectives

The data collected during monitoring and sampling activities will be used to assess potential impacts to the outdoor environment related to recovery well installation, specifically with respect to air quality and noise levels.

A strategic planning approach based on the scientific method will be employed for data collection activities, providing a systematic procedure to ensure that the type, quantity, and quality of data used in decision-making are appropriate for the intended application.

4.0 Real-Time Air Monitoring Strategy

Real-time air monitoring refers to the use of direct-reading instruments to provide a near-instantaneous readout of a chemical concentration in air. During the hours of active recovery well installation activities (i.e., daytime, approximately 9:00 AM to 5:00 PM), real-time air monitoring will be conducted along the perimeter of the Properties. The general locations of real-time air monitoring will be selected to provide coverage between the work area and nearby residences but will also include consideration of site and environmental (i.e., wind) conditions.

Real-time air monitoring will be conducted using handheld instruments at a height representative of the breathing zone. All instrumentation will be calibrated prior to use or per manufacturer recommendations. The presence or absence of odors, including odor characteristics and description if an odor is detected, will be documented with every handheld real-time air monitoring reading.

Target compounds for real-time air monitoring have been selected to include compounds potentially related to recovery well installation and/or the use of fuel-powered heavy equipment. Target compounds are total volatile organic compounds (VOCs), benzene, carbon monoxide (CO), and particulate matter with a diameter of 2.5 microns or less ($PM_{2.5}$). Real-time air monitoring for some compounds or indicators may be added, conducted less frequently, or discontinued as operational milestones are achieved and/or as real-time air monitoring results indicate that these compounds or indicators are not of concern.

Action levels are employed to provide information for corrective action to limit potential exposures. These values do not replace community exposure standards or guidelines but, rather, are intended to represent a concentration limit that triggers a course of action to better address public safety. Any action level exceedances will be communicated to the CTEH Project Manager (PM) and Project Technical Director (PTD), as well as on-site operational personnel (i.e., the Groundwater & Environmental Services, Inc. [GES] Manager). Work practices will be assessed and adjusted as necessary.

The target compounds, instrumentation, and action levels and associated actions that will be employed for real-time air monitoring are outlined in **Table 1**.

Table 1. Summary of Real-Time Air Monitoring Strategy

Analyte[†]	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Total volatile organic compounds (VOCs)	0.5 ppm 5 minutes	Document odors and potential sources of VOCs; Report reading to GES Manager for consideration of adjustment to work practices	Approximate background concentration of VOCs	MultiRAE PID (10.6 eV lamp)	0.1 ppm	Range: 0 – 5,000 ppm	Variable[§]
Benzene	Detection	Confirm reading with secondary instrument; Report reading to GES Manager for consideration of adjustment to work practices	To inform of potential off-site impact	UltraRAE	0.01 ppm	Range: 0 – 200 ppm	NA
				Gastec tube #121L	0.05 ppm	Range: 0.1 – 65 ppm **Volume: Pull 5 100-mL pump strokes**	Variable
Carbon monoxide (CO)	Detection	Confirm reading with secondary instrument; Report reading to GES Manager for consideration of adjustment to work practices	To inform of potential off-site impact	MultiRAE Sensor	1 ppm	Range: 0 – 500 ppm	NA
Particulate matter ($PM_{2.5}$)	0.088 mg/m^3 5 minutes	Confirm reading with secondary instrument; Report reading to GES Manager for consideration of adjustment to work practices	Upper-bound breakpoint for moderate AQI (1- to 3-hour average), as outlined in US EPA guidance	SidePak AM520	0.001 mg/m^3	Range: 0.001 – 100 mg/m^3	NA
Noise	60 dBA Instantaneous	Report reading to GES Manager for consideration of adjustment to work practices	Maximum continuous sound level from 7 AM to 7 PM, as outlined in the Township of Upper Makefield Municipal Code (Chapter 10, Part 4)	Quest Sound Examiner SE-402-IS Sound Level Meter	30 dBA	Range: 30 – 140 dBA	NA

[†] Protective Action Criteria (PAC) are established by the Department of Energy (DOE) and employ a hierarchy-based system of three common public exposure guideline systems, namely the Acute Emergency Guideline Levels (AEGLs) established by the United States Environmental Protection Agency (US EPA), the Emergency Response Planning Guidelines (ERPGs) established by the American Industrial Hygiene Association (AIHA), and the Temporary Emergency Exposure Limits (TEELs) established by the DOE. The PAC-1 values for benzene and carbon monoxide are 52 ppm and 75 ppm, respectively.

[§] Readings collected using the MultiRAE PID are recorded as uncorrected (raw) concentrations. The correction factors for various compounds using a MultiRAE PID are listed in Honeywell Technical Note TN-106B.

5.0 Air Sampling Strategy

Air sampling refers to the collection of discrete quantities of air using containers or chemical-specific media that are sent to an off-site laboratory for chemical analysis. Throughout the duration of recovery well installation activities, air samples will be collected at four locations along the perimeter of the Properties daily. The locations of air sampling will be selected to provide coverage between the work area and nearby residences.

Air samples will be collected using 1.4-liter evacuated canisters equipped with 24-hour regulators. Prior to air sample deployment, each canister will be inspected for damage, a leak test will be performed, and the initial pressure of the canister will be recorded. Air samples will be collected for a duration of approximately 24 hours at a height that is representative of the breathing zone (i.e., the canister inlet will be located four to six feet above the ground). At the end of the air sampling period, the final pressure of the canister will be recorded. Air samples will be labeled and sent under chain-of-custody to Pace Analytical National Center for Testing & Innovation (Pace) in Mt. Juliet, Tennessee, a National Environmental Laboratory Accreditation Program (NELAP)-accredited laboratory. The laboratory accreditation certificate is provided in **Attachment B**.

Air samples will be analyzed for select VOCs using United States Environmental Protection Agency (US EPA) Method TO-15, as outlined in **Table 2**. The selected VOCs were based primarily on the Short List of Petroleum Products in the Land Recycling Program Technical Guidance Manual established by the Pennsylvania Department of Environmental Protection (PA DEP). Target analytes are the following VOCs: benzene, toluene, ethylbenzene, xylene (both m&p-xylene and o-xylene), isopropylbenzene, methyl tert-butyl ether (also known as methyl tertiary butyl ether or MTBE), naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 1,2-dichloroethane (also known as ethylene dichloride or EDC), 1,2-dibromoethane (also known as ethylene dibromide or EDB), hexane, and cyclohexane.

Table 2. Summary of Analytical Method

Analyte	Media	Method
Select VOCs*	Evacuated canister (1.4-liter)	US EPA Method TO-15+

* Benzene, toluene, ethylbenzene, m&p-xylene, o-xylene, isopropylbenzene, methyl tert-butyl ether, naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 1,2-dichloroethane, 1,2-dibromoethane, hexane, and cyclohexane

\+ Benzene, naphthalene, 1,2-dichloroethane, and 1,2-dibromoethane will be analyzed using US EPA Method TO-15 in Selected Ion Monitoring (SIM) mode.

Air sampling results will be compared to Minimal Risk Levels (MRL) for acute inhalation established by the Agency for Toxic Substances and Disease Registry (ATSDR). Acute MRLs are health-protective guideline values that describe an estimate of the daily human exposure that is likely to be without appreciable risk of adverse non-cancer health effects for an exposure of 1 to 14 days in duration.

Target analytes and their respective laboratory method detection limits (MDL), laboratory reporting limits (RL), and MRLs for acute inhalation are outlined in **Table 3**. For reference, the MRLs for intermediate inhalation are also shown. Intermediate MRLs are health-protective guideline values that describe an estimate of the daily human exposure that is likely to be without appreciable risk of adverse non-cancer health effects for an exposure of 15 to 364 days in duration.

Table 3. Target Analytes, Detection Limits, and Minimal Risk Levels

Analyte	CAS Number	MDL (ppb)	RL (ppb)	ATSDR Acute MRL (ppb)	ATSDR Intermediate MRL (ppb)
Benzene+	71-43-2	0.0195	0.0400	9	7
Toluene	108-88-3	0.130	0.500	2,000	NE
Ethylbenzene	100-41-4	0.0778	0.200	5,000	2,000
m&p-Xylene	1330-20-7	0.174	0.400	2,000*	600*
o-Xylene	95-47-6	0.0887	0.200		
Isopropylbenzene	98-82-8	0.0722	0.200	NE	NE
Methyl tert-butyl ether	1634-04-4	0.0813	0.200	2,000	1,000
Naphthalene+	91-20-3	0.0248	0.0400	0.06	NE
1,2,4-Trimethylbenzene	95-63-6	0.0927	0.200	NE	NE
1,3,5-Trimethylbenzene	108-67-8	0.0853	0.200	NE	NE
1,2-Dichloroethane+	107-06-2	0.00700	0.0200	100	100
1,2-Dibromoethane+	106-93-4	0.0125	0.0200	NE	NE
Hexane	110-54-3	0.143	0.630	6,000	400
Cyclohexane	110-82-7	0.170	0.200	NE	NE

ppb = parts per billion (by volume)
+ Analyte will be analyzed using US EPA Method TO-15 in Selected Ion Monitoring (SIM) mode.
* The ATSDR MRL for total xylenes (CAS Number 1330-20-7) is 2,000 ppb (acute inhalation) and 600 ppb (intermediate inhalation). The concentration of total xylenes will be calculated by adding the concentrations of m&p-xylene and o-xylene.

It is important to note that there are some target analytes for which no MRL has been established (isopropylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 1,2-dibromoethane, and cyclohexane).

6.0 Noise Monitoring Strategy

During the hours of active recovery well installation activities (i.e., daytime, approximately 9:00 AM to 5:00 PM), noise monitoring will be conducted along the perimeter of the Properties in the same areas as real-time air monitoring. The general locations of noise monitoring will be selected to provide coverage between the work area and nearby residences.

Noise monitoring will be conducted using handheld Quest Sound Examiner SE-402-IS Sound Level Meters. All instrumentation will be calibrated prior to use or per manufacturer recommendations. The action level for noise monitoring is based on the maximum continuous sound level from 7:00 AM to 7:00 PM, as outlined in the Township of Upper Makefield Municipal Code (Chapter 10, Part 4).

The instrumentation, action level, and associated action that will be employed for noise monitoring is outlined in **Table 1** (Section 4.0).

7.0 Air Sample Labeling and Handling

7.1 Labeling

Air samples will be clearly labeled with the following information:

- Unique sample identification, including UMPA (Upper Makefield, PA)
- Sample type
- Start/stop date
- Start/stop time
- Start/stop pressure

The unique sample designation will include the following: four-letter site prefix, two-digit month, two-digit day, sample type, and three-digit numerical designation.

7.2 Handling

Samples will be collected using laboratory-supplied, certified clean evacuated canisters and labeled with sample identification number and sample date. Laboratory chain-of-custody (COC) will contain sample identification number, sample date, analysis and methodology requested, and time of sample collection. Custody seals will be placed on each sample container, if necessary, and chain-of-custody procedures will be maintained from the time of sample collection until arrival at the laboratory to protect sample integrity. Shipping or transport of samples to the laboratory will be done within a timeframe to meet the recommended holding times (i.e., 30 days from collection to preparation; 5 days from preparation to analysis).

8.0 Quality Assurance

Air monitoring and sampling will be carried out in conjunction with a well-defined quality assurance (QA) program. The QA program refers to the sampling, analysis, and data validation procedures for generating valid and defensible data. The types of quality control (QC) measures and samples that will be conducted are outlined below.

8.1 Field Calibration

Instruments used in the field will consist of RAE Systems by Honeywell MultiRAE and UltraRAE instruments, Gastec colorimetric detector tubes, TSI SidePak AM520 instruments, TSI Quest Sound Examiner SE-402-IS Sound Level Meters, and handheld data collection devices such as tablets/smartphones. All instruments will be maintained and calibrated daily in accordance with manufacturer recommendations and instructions. Operators of each instrument are responsible for maintaining (including proper battery charge) and operating the equipment such that it conforms to manufacturer specifications.

8.2 Laboratory Quality Assurance

Laboratory QC procedures will be conducted in accordance with the laboratory Standard Operating Procedures (SOP). Deliverables will contain the supporting documentation necessary for data validation. Internal laboratory QC checks will include method blanks, matrix spike/matrix spike duplicate (MS/MSD) samples, surrogate samples, calibration standards, and laboratory control standards (LCS).

8.3 Data Verification/Validation

Third-party data verification/validation will be performed by Environmental Standards, Inc. Data verification/validation will include, at a minimum, sample holding times, accuracy, precision, contamination of laboratory method blanks, and surrogate compound recovery. Accuracy will be determined by evaluating LCS and MS recovery. Precision will be determined by evaluating MS/MSD samples.

Level II data validation will be performed on 100% of the samples. In addition, Level IV data validation will be performed on at least 10% of all samples. The components of data verification/validation are summarized in **Table 4**.

Table 4. Summary of Data Verification/Validation Levels

Data Verification/ Validation Level	Definition
Level I	Sample data reporting only
Level II	Complete QC, including data blanks, spikes, duplicates (including matrix spike duplicates), laboratory control samples, relative percent difference (RPD), and percent recovery
Level III	Items listed in Level II plus QC limits and QA batch cross-reference table
Level IV	Items listed in Levels II and III, including sample raw data and chromatograms

9.0 Waste Disposal

Used personal protective equipment (PPE), if applicable, will be containerized and collected at the designated on-site waste staging area. All waste produced on-site will be managed and disposed of in accordance with the Waste Management Plan.

10.0 Records Management

Records management refers to the procedures for generating, controlling, and archiving project-specific records and records of field activities. Project records, particularly those that are anticipated to be used as evidentiary data, directly support current or ongoing technical studies and activities, and provide historical evidence needed for later reviews and analyses, will be legible, identifiable, retrievable, and protected against damage, deterioration, and loss on a centralized electronic database. Handwritten records will be written in indelible ink. Records may include, but are not limited to, the following: bound field notebooks on pre-numbered pages, sample collection forms, personnel qualification and training forms, sample location maps, equipment maintenance and calibration forms, chain-of custody forms, maps and drawings, transportation and disposal documents, reports issued as a result of the work, procedures used, correspondences, and any deviations from the procedural records. Documentation errors will be corrected by drawing a single line through the error so that it remains legible and writing the correction adjacent to the error; the change will be initialed by the responsible individual, along with the date of change.

Management of Change

Change from Version 1.0 to 1.1			
Summary of Changes: Mention(s) of specific property and property-specific maps removed; "Property" updated to "Properties" throughout; action level and associated basis for $PM_{2.5}$ revised; client name updated to Sunoco Pipeline LP; title page updated for version control of Version 1.0 to Version 1.1			
	NAME/ORGANIZATION	SIGNATURE	DATE SIGNED
Prepared by:	Sarah Burnett, PhD, CTEH		4/3/2025
Reviewed by:			
Approved by:			
Approved by:			

Change from Version 1.1 to 1.2			
Summary of Changes: Section 1.0 updated to specify that recovery wells may be installed in public areas; Section 5.0 updated to reference the laboratory accreditation certificate, which was added as Attachment B; Section 5.0 updated to specify the analytes analyzed in SIM mode, including an added footnote in Table 2, updated detection limits and footnotes in Table 3, and updated text after Table 3; Section 8.2 updated to reference laboratory Standard Operating Procedures; Section 9.0 updated to reference the Waste Management Plan; title page updated for version control of Version 1.1 to Version 1.2			
	NAME/ORGANIZATION	SIGNATURE	DATE SIGNED
Prepared by:	Sarah Burnett, PhD, CTEH		4/21/2025
Reviewed by:			
Approved by:			
Approved by:			

Attachment A: Incident Location Map

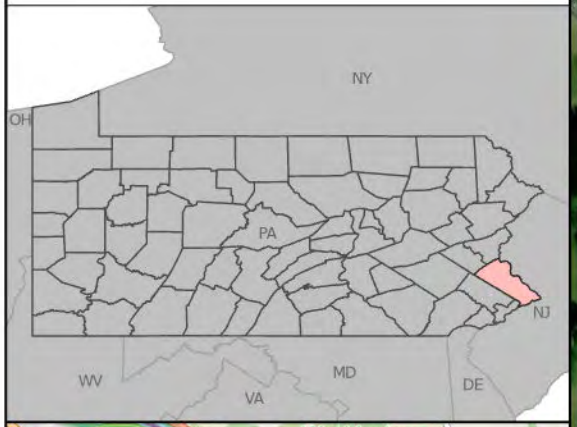
CTEH®

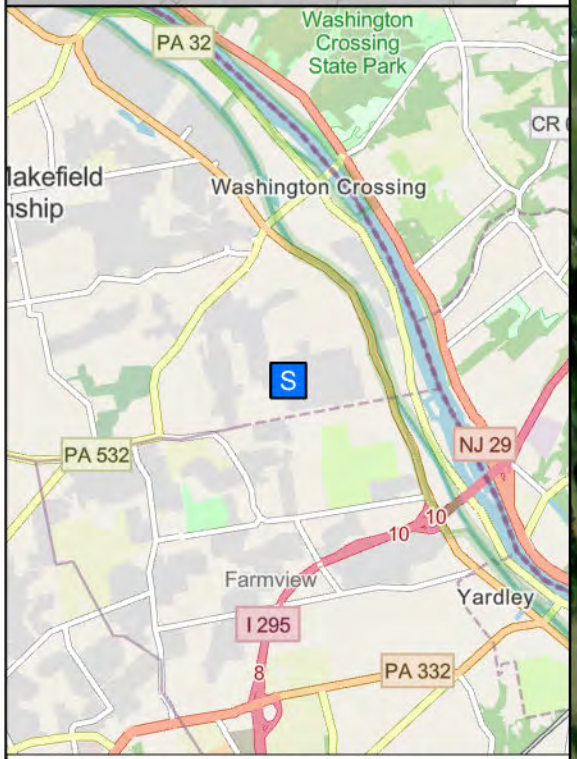
Upper Makefield Response

Incident Location

Washington Crossing, PA | Bucks County

PROJ-051861





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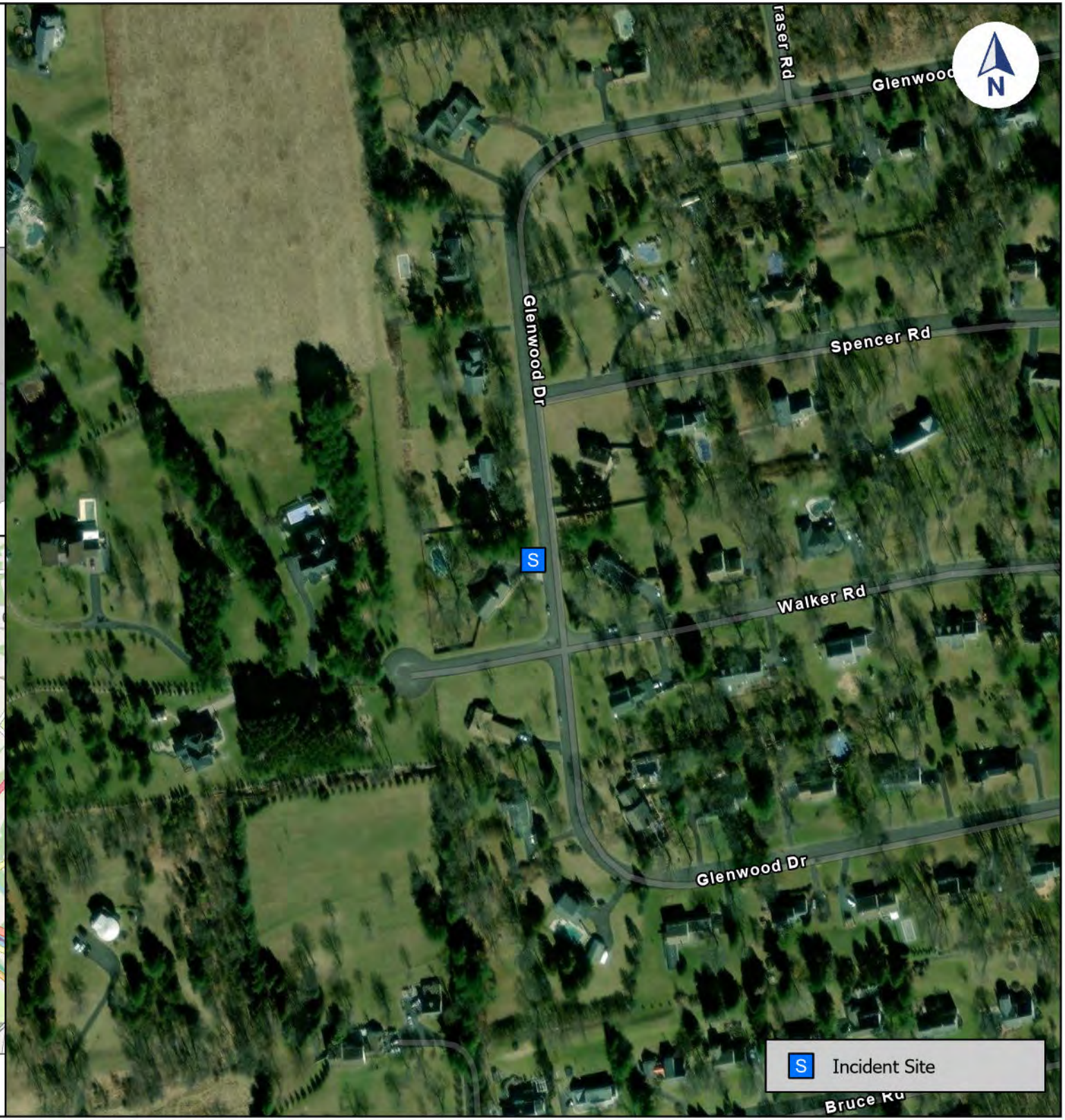

Attachment B: Laboratory Accreditation Certificate

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF LABORATORIES

LABORATORY ACCREDITATION PROGRAM

Certifies That

68-02979

Pace Analytical National Center for Testing & Innovation

12065 Lebanon Road, Mount Juliet, TN, 37122

Having duly met the requirement of
The act of June 29, 2002 (P.L. 596, No. 90)
dealing with Environmental Laboratories Accreditation
(27 Pa. C.S. 4104-4113) and the
National Environmental Laboratory Accreditation Program Standard
is hereby approved as an

Accredited Laboratory

to conduct analysis within the fields of accreditations more fully described in the attached Scope of Accreditation

NELAP accreditation granted by the PA DEP to an environmental laboratory is conditioned upon continued compliance with the current edition of the NELAC Standard or TNI Standard and the following Subchapters and Sections of 25 Pa. Code Chapter 252: Subchapter A (relating to general provisions); Subchapter B (relating to application, fees and supporting documents); Subchapter E (relating to proficiency test study requirements); Subchapter F (relating to assessment requirements); Subchapter G (relating to miscellaneous provisions); Section 252.307; and Section 252.401.

Expiration Date: **12/31/2025**

Certificate Number: **024**

Annmarie Beach

Annmarie Beach, Chief
Laboratory Accreditation Program
Bureau of Laboratories

Continued accreditation status depends on successful ongoing participation in the program
Certificate not transferable Surrender upon revocation
To be conspicuously displayed at the Laboratory
Not valid unless accompanied by a valid Scope of Accreditation
Shall not be used to imply endorsement by the Commonwealth of Pennsylvania
Customers are urged to verify the laboratory's current accreditation status
PA DEP is a NELAP recognized accreditation body

Stantec

Legend

Approximate Utility Locations
- Communications
- Electric
- Underground Piping

Proposed Recovery Well Locations

Sound Barrier Proposed Location

N

0 20 40 60 Feet
(At original document size of 11x17)
1 in = 60 feet

Notes
1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
2. Data Sources: Stantec
3. Background: USGS Topo Layers (TMN): USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State HIU; NOAA National Centers for Environmental Information. Data refreshed February, 2025.
Nearmap WMS Server:

Project Location
Upper Makefield Township,
Bucks County, PA

Prepared by GWC on 2025-04-10
TR Review by XXX on 2025-xx-xx
IR Review by XXX on 2025-xx-xx

Client/Project 195603566
Energy Transfer Marketing & Terminals L.P.
ET Washington Crossing

Figure No.
1A

Title
Subsurface Utility Survey Map and Proposed Recovery Well Locations

\\us0245-prfss01\shared_projects\195603566\03_data\gis_cad\gis\PRO\utilities map.aprx Revised: 2025-04-10 By: GCurry

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Stantec

Legend

Approximate Utility Locations
- Communications
- Electric
- Underground Piping

Proposed Recovery Well Locations

Sound Barrier Proposed Location

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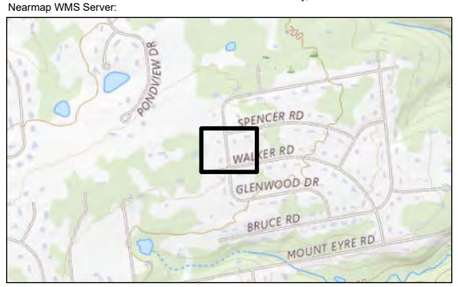
Nearmap WMS Server:



Project Location
Upper Makefield Township,
Bucks County, PA

Prepared by GWC on 2025-04-10
TR Review by XXX on 2025-xx-xx
IR Review by XXX on 2025-xx-xx

Client/Project 195603566
Energy Transfer Marketing & Terminals L.P.
ET Washington Crossing

Figure No.
1B

Title
Subsurface Utility Survey Map and Proposed Recovery Well Locations

\\us2245-prfs01\shared_projects\195603566\03_data\gis_cad\gis\PRO\utilities map.aprx Revised: 2025-04-10 By: GCurry

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Stantec

Legend

Approximate Utility Locations
- Communications
- Electric
- Underground Piping

Proposed Recovery Well Locations

Sound Barrier Proposed Location

N

0 20 40 60 Feet
(At original document size of 11x17)
1 in = 60 feet

Notes

1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
2. Data Sources: Stantec
3. Background: USGS Topo Layers (TMN): USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State HIU; NOAA National Centers for Environmental Information. Data refreshed February, 2025.
Nearmap WMS Server:

Project Location
Upper Makefield Township,
Bucks County, PA

Prepared by GWC on 2025-04-10
TR Review by XXX on 2025-xx-xx
IR Review by XXX on 2025-xx-xx

Client/Project 195603566
Energy Transfer Marketing & Terminals L.P.
ET Washington Crossing

Figure No.
1C

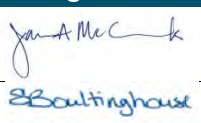
Title
Subsurface Utility Survey Map and Proposed Recovery Well Locations

\\us0245-prjfsd01\shared_projects\195603566\03_data\gis_cad\gis\PRO\utilities map.aprx Revised: 2025-04-10 By: GCurry

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Attachment 8

WASTE MANAGEMENT PLAN
Upper Makefield Response
Washington Crossing, PA

Status	Name	Signature	Title	Date
Prepared By:	James McCormack		Sr. Principal	3/4/2025
Approved By:	Stacy Boultinghouse		Sr. Mgr.	3/4/2025
Approved By:				
Approved By:				
Approved By:				

February 26, 2025

Waste Management Plan Change Log

Name	Signature	Change Comments	Date

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List of Acronyms and Abbreviations

BMP	Best Management Practices
COC	Chemical of Concern
CoC	Chain-of-Custody
CFR	Code of Federal Regulations
DOT	Department of Transportation
EPA	U.S. Environmental Protection Agency
ERG	Emergency Response Guide
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HM	Hazardous Material
HW	Hazardous Waste
IC	Incident Commander
LDR	Land Disposal Restrictions
LEPC	Local Emergency Planning Committee
NRC	National Response Center
NHW	Non-Hazardous Waste
OSHA	Occupational Safety and Health Administration
PDEP	Pennsylvania Department of Environmental Protection
PHMSA	Pipeline Hazardous Materials Safety Administration
POC	Point of Contact
POL	Petroleum, Oil, and Lubricant
PPE	Personal Protective Equipment
ppm	Parts Per Million
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
RQ	Reportable Quantity
SDS	Safety Data Sheet
SOP	Standard Operating Procedure
SPCC	Spill Prevention, Control, and Countermeasure
SW	Solid Waste
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
TSDF	Treatment, Storage, and Disposal Facility
TSS	Total Suspended Solids
UHC	Underlying Hazardous Constituent
WSD	Waste Stream Determination

Definitions

Accumulation Start Date – The date that hazardous waste (HW) is first placed in a container.

Best Management Practices – Control measures and decisions based on the most current professional and technical standards for the protection, enhancement, and rehabilitation of natural resources. BMPs include schedules of activities, prohibited practices, maintenance procedures, treatment requirements, operating procedures, control practices, and other management practices to prevent or reduce pollution.

Characteristic Waste – A waste that exhibits any one or more of the following characteristic properties: ignitability, corrosivity, reactivity or toxicity. Each is assigned the hazard code indicated (40 CFR 261.30).

Characterization – The process of identifying waste constituents, their concentrations, and the work process generating the waste. Characterization determines how waste may be handled, treated, and disposed. Characterization is required to identify the EPA waste codes, the underlying hazardous constituents (UHCs), and the DOT proper shipping name.

Closure – The act of securing HW management in accordance with applicable Resource Conservation and Recovery Act (RCRA) requirements.

Combustible Liquid – A combustible liquid is defined at 49 CFR 173.120(b)(1) as any liquid that does not meet the definition of any other hazard class and has a flash point of >60°C (>140°F) and <93°C (<200°F).

Container – As defined in 40 CFR 260.10, any portable device, in which a material is stored, transported, treated, disposed, or otherwise handled.

Contaminant – Any chemical that when present causes the waste to be regulated.

Corrosive HW – A solid waste exhibits the characteristics of corrosivity if a representative sample of the waste has either of the following properties as defined in 49 CFR 261.22: (1) is aqueous and has a pH less than or equal to 2, or greater than or equal to 12.5, as determined by a pH meter using Method 9040C in “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” or (2) is a liquid and corrodes steel (Society of Automotive Engineers [SAE] 1020) at a rate greater than 6.35 mm (0.25 inch) per year at a test temperature of 55° Celsius (130° Fahrenheit) as determined by Method 110A (“Test Methods for Evaluating Solid Waste, Physical/Chemical Methods”).

Debris – Any solid material with a diameter of 2.4 inches or larger that is intended for disposal, including manufactured objects, plant or animal matter, or natural geologic material such as brushes, rags, personnel protective equipment (PPE), large and small equipment, etc.

Dilution – The deliberate mixing of HW with another material with the purpose of changing either the characteristic(s) or the concentration of a constituent in the waste. Dilution of a HW constitutes “Treatment” and is prohibited without a permit.

Disposal – The process of treating a HW to render it non-hazardous or to place the HW into a permitted end facility such as a HW landfill or other permitted TSDF. Disposing of any waste into a wastewater treatment system, storm drain, surface water, or upon land is prohibited.

Empty Container – As defined in 40 CFR 261.7, a container or an inner liner removed from a container from which all material/waste (except compressed gas or an identified acute HW) has been removed that can be removed after pouring, puncturing, pumping, or aspirating until no more than 1 inch of residue

remains on the bottom, or no more than 3 percent by weight of the total capacity of the container remains if it is less than or equal to 119 gallons in size.

Emergency Planning and Community Right-to-Know Act – 40 CFR Parts 350 to 372 intend to: (1) identify the quantities of chemicals present on, or released from, facilities; (2) understand the potential problems that hazardous materials (HMs) pose to surrounding communities and environment; and (3) provide information to the public and local emergency planning and response organizations. The four major provisions of EPCRA are emergency planning (sections 301-303), emergency release notification (section 304), hazardous chemical storage reporting (sections 311-312), and toxic chemical release inventory (section 313).

U.S. Environmental Protection Agency Hazardous Waste Codes – The specific alphanumeric sequence assigned by EPA to specify type and characteristic of a HW.

Flammable Liquid – A flammable liquid is defined at 49 CFR 173.120(a) as a liquid with a flash point of ≤60°C (≤140°F), or any liquid in bulk packaging with a flashpoint of ≥37.8°C (≥100°F) that is intentionally heated and transported above its flashpoint (some exceptions).

Generator of Record – The owner/operator recognized by EPA as the generator of a HW and holder of the EPA Generator ID number of a contiguous facility.

Hazardous Material – Any material designated by U.S. Department of Transportation (DOT) as posing a potential threat while being transported. HMs are listed in 49 CFR Part 172.

Hazardous Substance – A material included in the specific list of chemicals designated by EPA in 40 CFR Part 302 that may pose a substantial threat to human health or the environment when discharged into the environment because of its quantity, concentration, or physical, chemical, or infectious characteristics. HS is regulated only when released in a quantity equal to or exceeding the reportable quantity (RQ) listed in 40 CFR Part 302.

Hazardous Waste – Any discarded SW as defined in 40 CFR 261.3 (liquid, semi-solid, solid, or gaseous) that meets the definition of a HW. An SW is a listed HW if it is specifically listed in 40 CFR 261.31 (F-list), 261.32 (K-list), or 261.33 (P- or U-list), and/or is a characteristic HW if it exhibits the characteristics of ignitability, corrosivity, reactivity, or toxicity per the Toxicity Characteristic Leaching Procedure (TCLP).

Hazardous Waste Generator – Any person, by site, whose act or process produces HW or whose act first causes a HW to become subject to regulation.

Head Space – The unused volume inside a filled container that allows for expansion (also known as “ullage” in a container of liquid or a tank).

Ignitable HW – Liquids with flash points below 140 degrees Fahrenheit (60° Celsius), non-liquids that cause fire through specific conditions, and ignitable compressed gases and oxidizers as defined in 49 CFR 261.21.

Leachate – The liquid, including any suspended components in the liquid; that has percolated through or drained from a waste.

Manifest – EPA Form 8700-22 (and EPA Form 8700-22A, if necessary) shipping document, originated and signed by the generator, which accompanies and is used for tracking the transportation of HW.

Manifest Tracking Number – The alphanumeric identification number (unique three-letter suffix preceded by nine numerical digits) that is preprinted in Item 4 of the manifest by a registered source.

Oil –oil of any kind or in any form. This includes petroleum, fuel oil, sludge, oil refuse, oil mixed with wastes other than dredged spoil, fats, oils or greases of animal, fish, or marine mammal origin, vegetable oils, including oil from seeds, nuts, fruits, or kernels, and other oils and greases, including synthetic oils and mineral oils. The definition of oil also includes non-petroleum oils, such as silicone fluids, tung oils, and wood-derivative oils such as resin/rosin oils.

Other Regulated Materials – A material such as a consumer commodity that, although otherwise subject to Subpart D of 49 CFR Part 173, presents a limited hazard during transportation due to its form, quantity, and packaging. It must be a material for which exceptions are provided, as shown in the table in 49 CFR 172.101.

pH – An artificial scale used by chemists to measure the relative acidity and alkalinity of weak acids and bases. The usual range of the scale is from 1-13, where pure water is 7. A pH below 7 indicates an acid, and a pH above 7 indicates a base. It is important to note that each number of the scale is ten times the previous number. For instance, an acid of pH 1 is 100,000 times more acidic than one with a pH of 6.

Point of Generation – Identifies the place a material first becomes subject to HW regulations at the department, unit, or work center with the intention of disposal.

Profile Number – A unique alphanumeric identification number used to designate a specific waste stream.

Profile Sheet – Forms used to document specific disposal information for each waste stream sent to the disposal facility.

Reactive HW – A SW exhibits the characteristics of reactivity if a representative sample of the waste has any of the following properties as defined in 49 CFR 261.23: (1) It is normally unstable and readily undergoes violent change without detonating; (2) It reacts violently with water; (3) It forms potentially explosive mixtures with water; (4) When mixed with water, it generates toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment; (5) It is a cyanide or sulfide-bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment; (6) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement; (7) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure; or (8) It is a forbidden explosive as defined in 49 CFR 173.51, a Class A explosive as defined in 49 CFR 173.53, or a Class B explosive as defined in 49 CFR 173.88.

Reclaimed – Any material that is processed to recover a usable product or to regenerate a material (40 CFR 261.1).

Recycled – Any material that is converted into a reusable material.

Reportable Quantity – Identifies the amount of material (pounds or gallons) that triggers a reporting requirement to regulatory agencies when spilled or released to the environment. RQ amounts are specific to each material.

Representative Sample – A sample of a universe or whole (e.g., waste pile, groundwater) that can be expected to exhibit the average properties of the universe or whole.

Reused – A material that is employed as an ingredient in an industrial process to make a product or employed in a function or application as an effective substitute for a commercial product without reclaiming.

Safety Data Sheet – The document issued by the product manufacturer that communicates the hazards found in the product.

Sludge – Any solid, semi-solid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility exclusive of the treated effluent from a wastewater treatment plant.

Solid Waste – Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility. An SW is also other discarded material including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and/or community activities.

Sorbent – Material used to soak up free liquids by either adsorption, absorption, or both.

Spill/Release – Intentional or accidental loss including any leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of an HS into the environment.

Transporter – Person engaged in offsite transportation of HW by air, rail, highway, or water.

Treatment – Any method, technique, or process (including neutralization) designed to change the physical, chemical, or biological character or composition of any HW to neutralize such waste, recover energy or material resources from the waste, or render such waste non-hazardous or less hazardous; safer to transport, store, or dispose of; amenable for recovery or storage; or reduced in volume. The facility is not permitted to treat HW under any conditions.

Treatment, Storage, and Disposal Facility – A permitted HW management facility, HW storage facility (HWSF), or Part-B facility that receives HW for treatment, storage, or disposal.

Toxic Characteristic Leachate Procedure – A sample extraction method for chemical analysis which is designed to simulate leaching in a landfill of organic and inorganic analytes present in liquid, solid, and multiphase wastes.

Toxic HW – (a) An SW exhibits the characteristic of toxicity if, using the TCLP, test Method 1311 in “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” EPA Publication SW–846, as incorporated by reference in §260.11 of this chapter, the extract from a representative sample of the waste contains any of the contaminants listed in table 1 at the concentration equal to or greater than the respective value given in that table. Where the waste contains less than 0.5 percent filterable solids, the waste itself, after filtering using the methodology outlined in Method 1311, is considered to be the extract for the purpose of this section. (b) An SW that exhibits the characteristic of toxicity has the EPA HW Number specified in Table 1 which corresponds to the toxic contaminant causing it to be hazardous as defined in 40 CFR 261.24.

Ullage – The unused volume inside a filled container that allows for expansion.

Underlying Hazardous Constituent – Any constituent listed in 40 CFR 268.48 that can reasonably be expected to be present at the point of generation of the HW at a concentration above the constituent-specific universal treatment standards.

United Nations/North American Designations – DOT identification numbers assigned to HM are preceded by either a UN or NA designation and are indexed by response instructions found in the Emergency Response Guide (ERG) for use in the event of an accident. Those preceded by UN are associated with descriptions considered appropriate for international shipments as well as domestic shipments. The NA designation is limited to use in the United States and Canada only.

Used Oil – Oil that has been refined from crude oil and used as a lubricating, hydraulic, or heat-transfer fluid and contaminated through that use. Used oil has the potential for reuse or recycling.

Waste Characterization – The process of identifying waste components and their chemical concentrations as well as the work process used to generate the waste. Waste characterization is required to ensure the correct identification of the waste and use of EPA waste numbers/codes necessary for the safe and proper handling, treatment, and disposal of HW.

Waste Stream Determination – RCRA regulations at 40 CFR 262.11 require that any person who produces or generates a waste must determine if that waste is hazardous. In doing so, 40 CFR 262.11 presents the steps in the HW identification process: 1) Is the waste a "solid waste"? 2) Is the waste specifically excluded from the RCRA regulations? 3) Is the waste a "listed" hazardous waste? 4) Does the waste exhibit a characteristic of hazardous waste?

Waste Profiling – A method to identify and classify waste streams based on analytical testing or user knowledge of the specific process.

Wastewater – Water that contains less than 1% by weight total organic carbon (TOC) and less than 1% by weight total suspended solids (TSS).

1.0 Introduction

This Waste Management Plan (WMP) was prepared by the Environmental Team supporting Pipeline Operations to provide a plan for the management of waste during the Upper Makefield Response, Washington Crossing, PA (UM Response). In January 2025 a release involving refined product including jet fuel from the 14-inch Twin Oaks – Newark Sement operated by Sunoco Pipeline L.P., a subsidiary of Energy Transfer LP (Company), was confirmed. The GPS coordinates for the release site (hereinafter referred to as Site) are: 40.271184, -74.875953. A map of the incident location is provided in **Attachment A**.

This WMP establishes and describes procedures and protocols to be followed by responders for all spill response materials, recovered and generated. The plan provides for the management, transportation, interim storage and final disposal of the anticipated waste streams and categories that may be generated. This WMP is designed to only cover waste generated from this release. This document is available upon request to regulators, site personal and contractors working on the response that accumulate, generate, transport, treat, store, or dispose of HW for compliance.

The collection, storage, transportation, treatment and disposal of waste will be conducted in a manner that is both safe and environmentally sound.

This WMP must be reviewed and updated whenever site conditions or operations change that would affect waste accumulation, generation, transportation, treatment, storage, or disposal.

1.1 Applicability

This WMP provides requirements and guidance for the proper management of all waste generated at the UM Response. All personnel, including contractors working at the UM Response retain liability for and must abide by this WMP. Failure to abide by this WMP may result in revocation of access to the site. Any fines, violations, or penalties may be delegated to the offending entity (e.g., contractor). Pipeline Operations grants access to contractors working at the site; therefore, any contractor improperly managing HW or failing to comply with this instruction may be denied access to the site.

This WMP will be reviewed periodically and updated whenever site conditions or operations change that would affect waste accumulation, generation, transportation, treatment or disposal.

1.2 Health and Safety

Pipeline Operations maintains copies of this plan and makes it available to all personnel and contractors that accumulate, generate, transport, store, or dispose of waste.

Health and safety of the associates, workers, community, and the environment will be of the utmost priority while implementing this plan. All personnel will be required to review and adhere to site-specific safety plans as well as company/contractor-specific Health and Safety Plans (HASP), and 29 CFR 1910.120 HAZWOPER requirements, as applicable. Pre-job tailgate safety briefings will be conducted prior to going into the field where samples of waste and other materials will be collected and prepared.

Specific field activities will only be conducted under weather or other environmental conditions that do not create unsafe working conditions, and the appropriate personal protective equipment (PPE) will be utilized for each task. Any incident will be promptly reported in accordance with the site-specific site safety plan and Pipeline Operations' directives.

2.0 Regulatory Framework

The Resource Conservation and Recovery Act (RCRA) authorized the U.S. Environmental Protection Agency (EPA) to implement regulations for the management of HW from the point of generation through final disposal ("cradle to grave"). EPA granted the State of Pennsylvania Department of Environment Protection (PDEP) authority to implement and enforce regulations for identification (ID), packaging, labeling, storing, and transporting HW and NHW, as well as treatment standards for proper disposal of regulated waste.

2.1 Federal and State Regulations

The following regulations mandate the procedures and requirements set forth in this instruction and are therefore not discretionary.

- 40 Code of Federal Regulations (CFR) Parts 260 through 266, and Part 268 - Regulations for the management of HW
- 25 Pa. Code § 260a. - Hazardous Waste Management System: General
- 25 Pa. Code § 261a - Identification and Listing of Hazardous Waste
- 25 Pa. Code § 262a - Notification Requirements and Standards Applicable to Generators of Hazardous Wastes
- 40 CFR Part 273 - Standards for Universal Waste Management
- 40 CFR Part 279 -.11, Management of used oil and used oil filters
- 49 CFR Parts 171-180 - U.S. Department of Transportation (DOT) regulations for transportation of HW on public roads
- 49 CFR Parts 390 - 397 - U.S. DOT regulations for driver qualifications, the equipment in the vehicle, and routing of some HW shipments
- 40 CFR Parts 116-117 - The regulations of reporting the release or chemical spill
- 40 CFR Part 503 – Establishes the standards for the use or disposal of sewage sludge
- 40 CFR 112 - Oil Pollution Prevention regulations

3.0 Waste Management Best Practices

The following best practices must be followed in the management of wastes generated in a spill response effort:

a. Dispose or manage wastes and recoverable materials in permitted or otherwise authorized locations. Unauthorized disposal or management will not be tolerated.

b. Obtain Safety Data Sheets (SDSs) for all known products involved in waste management.

c. Reduce waste generation whenever practical. This is known as waste minimization or pollution prevention.

d. Reuse or recycled materials whenever practical. This not only lowers a consumption of raw materials, it also eliminates the need for waste disposal. Recycling in reuse of recovered oil and oil and water is the preferred option.

e. Avoid co-mingling wastes of different classifications. For example, never place non-hazardous wastes in the same container as hazardous waste. In addition, keep recyclable material separate from nonrecyclable waste. It may be difficult or impossible to separate wastes after their co-mingled.

f. Maintain good housekeeping practices. Employees and contractors should maintain neat, clean-up work areas to reduce the need for additional cleanup and the associated waste.

g. Properly store wastes, especially hazardous waste, to avoid releases to soil, water, or air, and to avoid consumption by wildlife until they can be appropriately managed.

h. Clearly identify waste containers. Use a label or other means to clearly identify the contents of containers of hazardous, non-hazardous, and inert wastes.

i. Document quantities and disposition of all hazardous and NHW as instructed in this plan. Waste tracking is required for all wastes. This information will be included in the final report delivered at the conclusion of response activities.

j. Recovered liquids should be collected and stored in as large a container as possible (UN approved drum, tote tank, tanker truck, etc.) to maximize dewatering potential, facilitate uninterrupted recovery, and to minimize equipment decontamination requirements.

k. Communicate your ideas to your supervisor for waste minimization and waste management.

l. Maintain security at all sites where waste is held.

m. The site manager is responsible for determining if any regulatory permits (e.g., NPDES) or plans (SWP3 or SPCC Plan) are required for areas where waste is stored.

4.0 Waste Characterization

All waste generated on site will need to be characterized following the procedures detailed below.

4.1 Potential Waste Streams

The potential waste streams will include, but are not limited to, the materials in **Table 4-1**.

Currently the estimated volumes of each waste stream and released materials are unknown due to the nature of the incident. All exempt and NHW classifications of materials associated directly with the response (other than for general trash) will be validated though the application of generator knowledge and sampling and analysis as necessary, per the procedure outlined below and in accordance with EPA SW-846.

Table 4-1: Potential Waste Streams

Waste Stream	Sources	Material Generated
Oil/Oily water (mix)	Mechanically recovered using aqua-bailers (or equivalent)	Free product
Soil	Excavation / recovery activities; Site assessment and characterization activities including drilling and development of recovery and monitoring wells	Unimpacted and Impacted soil; vegetation; soil cuttings from approved Site Characterization and Assessment activities
Solids/Debris/Sorbent Materials	Recovery activities	Saturated sorbent socks
Personal Protective Equipment (PPE)	Worker garments used in the cleanup	Tyvek, Gloves, Boots, etc.
Municipal / General Trash	Daily work activities	Food and beverage debris and containers
Investigative Derived Waste (IDW)	Site assessment and characterization activities including drilling and development of recovery and monitoring wells; purge water from sampling of wells	Groundwater
Decontamination Waste	Decontamination of equipment used in site assessment and characterization activities; sampling	Non-phosphate detergent; water
Biological Waste	Portable toilets	Sewage

Note: This list of potential waste streams is to be updated when new waste streams are identified throughout the recovery activities.

4.2 Waste Stream Determination

40 CFR 262.11 requires that any person who produces or generates a waste must determine if that waste is hazardous.

4.3 Completing the Determination

The following four questions must be answered to make a WSD:

1. Is the waste a SW as defined in 40 CFR 261.2?

   The first step in determining if a material is a HW is to determine whether it is classified as a SW. The rules specify that a material cannot be a HW unless it is first determined to be a SW.

2. Is the waste specifically excluded from RCRA regulations?

The next step is to determine if the waste qualifies for an exemption or exclusion from RCRA regulations.

3. Is the waste a “listed” HW?

   RCRA regulations include four lists of wastes, designated with the letters F, K, P, and U.

4. Does the waste exhibit a characteristic of HW?

A characteristic HW is an SW that exhibits one or more of the following HW characteristics:

- Ignitability (D001)
- Corrosivity (D002)
- Reactivity (D003)
- Toxicity (D004-D043)

The site conducts WSDs at the point of generation for each waste generated at the site. User knowledge, HW analysis, or a combination of the two methods are used to complete the WSD process.

WSD documentation for HW and NHW are maintained by the local Environmental Specialist, along with supporting documentation that is readily available.

5.0 Sampling

This plan addresses sampling of only those materials generated during the incident response activities for purposes of waste classification and disposal. Sampling for any site investigation or final remediation/corrective action purposes after the incident response activities are completed will be addressed in greater detail during the remediation phase. Emergency response activities generate waste materials from multiple locations (i.e., product clean-up, decontamination area, incident area, released materials collection, etc.) and the waste materials collected are brought to designated storage areas within Company-maintained staging areas at the Bucks Pump Station and Ft. Mifflin. Safety considerations for the emergency responders and samplers will be the top priority when conducting any sampling for waste classification purposes.

Waste characterization sampling will be conducted from onsite soil stockpiles prior to loading into roll-off boxes for transportation offsite for final disposition. Other waste characterization sampling will occur, as necessary, from various storage containers (i.e., drums, frac tanks, vac trucks, etc...) located in the designated storage areas.

Representative samples will be collected within a reasonable timeframe from arrival at the designated storage area. Sampling of contaminated and phase-separated aqueous liquids (oil and water) will occur directly from the storage containers containing the released liquid materials.

5.1 Sample and Data Collection

Labels will be affixed to each sample container prior to or during sampling. At a minimum, the labels will include the ‘Sample ID’, the date and time the sample was collected, initials of the sample collector, and the specific analysis the container is for (including any preservatives used).

Chain-of-Custody (CoC) forms will track all samples sent to the offsite laboratory for analyses and testing. The CoC will identify the waste stream sampled using the ‘Sample ID’, the date and time the sample was collected, number and type of containers filled, any sample preservatives used, the name of the person who collected the sample, and the specific analyses required.

5.2 Sampling Methods

Personnel will collect representative samples from the selected waste streams identified in **Table 5-1** for laboratory analysis. The methods and equipment used for sampling will be based on the physical form and consistency of the waste being sampled. Personnel will select the most appropriate representative sampling methods, techniques, devices, and containers based on guidance published in EPA document SW-846 Chapter 9 “Field Sampling Methods”. Sample volumes, container types, and preservation requirements for the required analyses are based on the waste streams and test methods.

Clean coliwasas, tubes, drum thieves, corers, hand trawls/scoops or other compatible collection device will be used to collect representative samples of waste containers. Samples will be taken both vertically and horizontally throughout the waste. If there are multiple containers of the same waste stream, samples will be collected from the individual containers and composited to ensure a true representative sample. Any excess waste material collected will be returned to its original waste container.

For liquids, the sample collector will insert a coliwasa or equivalent into the container from the top, pushing slowly until the bottom of the container is reached. The contents of the sampling device will be transferred to the appropriate sample container.

For solids, a representative sample may be difficult to obtain. In these cases, the sample collector will attempt to obtain a sample that is as representative as possible by collecting multiple samples that reflect the waste type and quantities within the container.

All samples requiring chemical preservation will be placed into sample bottles pre-filled by the laboratory with the correct amount and type of preservative required for that specific test method. All samples requiring preservation by cooling to ≤ 6° will be placed into a cooler containing ice immediately following sampling collection. All samples collected will be delivered to the lab by the next business day.

5.3 Sample Analysis

This section outlines the analytical parameters and test methods that will be used for waste samples collected during field activities. Samples will be sent to a State accredited laboratory.

5.4 Analytical Parameters

The following analytical parameters may be utilized for the waste samples collected during field activities.

Table 5-1: Analytical Sampling Parameters and Test Methods

Parameter	Description	Test Method
Flashpoint (Ignitability)	This parameter indicates the fire-producing potential of the liquid waste and determines whether the waste is considered a D001 RCRA Ignitable waste.	An offsite laboratory will analyze this parameter using EPA Test Method 1020.
pH (Corrosivity)	This parameter determines whether the liquid waste is considered a D002 RCRA corrosive waste.	An offsite laboratory will analyze this parameter using EPA Test Method 9045.
TCLP Volatile Organic Compounds (VOCs)	This parameter determines if the waste is potentially a characteristic hazardous waste (D018-D022, D028-D029, D035, D039-D040, & D043)and if any VOC exceeds the limits in 40 CFR 261.24.	An offsite laboratory will analyze this parameter using EPA Test Methods 1311/8260.
Reactivity	This parameter determines whether the liquid waste is considered a D003 RCRA reactive waste.	An offsite laboratory will analyze this parameter using EPA Test Method SW-846, Ch. 7.
RCRA Metals	This parameter determines if the waste is potentially a characteristic hazardous waste (D004-D011) and if any Metals exceed the limits in 40 CFR 261.24.	An offsite laboratory will analyze this parameter using EPA Test Method 1311/6010

5.5 Quality Assurance and Quality Control

Upon receipt of the analytical results, personnel will review the results of the laboratory's Quality Assurance/Quality Control documentation for anomalies.

5.6 Field Sampling Equipment Decontamination Procedures

Decontamination procedures refer to the steps undertaken to minimize the potential for offsite contamination and cross-contamination between individual sampling locations. Disposable equipment, where possible, will be used to deter potential cross contamination. Prior to collecting any sample for this investigation, the following decontamination procedures will be undertaken non-disposable sampling equipment which come into contact with sampling media will be decontaminated using a bristled brush and a solution comprised of a laboratory grade, non-phosphate detergent (e.g., Alconox or Liquinox) and deionized water. Depending on ancillary activities being conducted for the response to this release, the decontamination of sampling equipment will be conducted over poly sheeting at the sample location or

in a nearby designated area. The sampling equipment to be decontaminated will first be placed in a bucket containing the detergent solution and thoroughly washed using a bristled brush. The items will then be transferred to the second 5-gallon bucket containing deionized water for rinsing. Following the initial rinsing, the item will be held over the same bucket while distilled water is again carefully decanted over each item. Nitrile gloves will be worn by sampling personnel and changed between activities at each discrete sample collection location. Previously worn nitrile gloves will be discarded in appropriate waste receptacles with other PPE. All waste generated by decontamination activities will be handled, stored, classified, and disposed of in accordance with this WMP.

6.0 Waste Management Table

Disposal, reclamation, and recycling facilities will vary based on the final classification and characterization of the recovered materials/wastes. The facilities mentioned in **Table 6-1** include those facilities that could potentially accept reclaimed, reused, or recyclable released materials.

Table 6-1: Waste Disposal

Waste Description	Waste Category	Method of Removal	Temporary Disposal	Ultimate Disposal
Oil/oily water (mix)	TBD by Waste Determination	55-gal drum in poly overpack	Waste Staging Area at Bucks Pump Station	Sunoco Inc (R&M) Eagle Point Refinery [EPA ID No. NJD990753162] / Oil Recycling Facility
Soil	Non-hazardous by Waste Determination	Excavation/ Poly-lined Roll-off box	Waste Staging Area in Ft. Mifflin	Republic Conestoga Landfill EPA PADEP [SWP No. 101509 / ID No. PA0000015867] / Non-Hazardous Landfill
Solids/Debris/Sorbent Materials	Non-hazardous by Waste Determination	Excavation/Hand/Poly Lined Roll-off box	Waste Staging Area at Bucks Pump Station	Republic Conestoga Landfill EPA PADEP [SWP No. 101509 / ID No. PA0000015867] / Non-Hazardous Landfill
Personal Protective Equipment (PPE)	TBD by Waste Determination	Hand/Poly Lined Roll-off box, drums	Waste Staging Area at Bucks Pump Station	TBD / Non-Hazardous Landfill
Municipal / General Trash	Non-hazardous Waste	Hand/Poly Lined Roll-off box	Waste Staging Area at Bucks Pump Station	TBD / Non-Hazardous Landfill
Investigative Derived Waste (IDW)	TBD by Waste Determination	55-gal drum in poly overpack	Waste Staging Area at Bucks Pump Station	TBD / Non-Hazardous Landfill
Decontamination Waste	TBD by Waste Determination	55-gal drum in poly overpack	Waste Staging Area at Bucks Pump Station	TBD / Non-Hazardous Landfill
Biological Sludge	Non-hazardous Waste	Vac truck	NA	TBD / Non-Hazardous Landfill

6.1 Waste Disposal Sampling

A waste sample collection may be required for the ultimate disposal facility acceptance of the waste. If any waste stream can be changed to a different waste classification, supported by the waste determination process, additional sampling may be required to maintain this classification.

6.2 Waste Storage Areas

A temporary waste storage area has been established for solid and liquid materials that have been identified.

- Solid waste will be containerized at the staging areas in poly-lined roll off boxes or stockpiled on a poly-lined and bermed staging area. Solid waste will be separated according to contents.
- Liquid wastes will be containerized in steel drums and/or pumped into vac trucks which may further be temporarily stored in frac tanks (as applicable).
- Waste containers will be clearly identified. Each container is to be visibly labeled on opposite sides indicating the contents (e.g., impacted soil, ditch frac water, PPE, etc.) and the date the container began collecting waste.
- A staging area log for tracking on site accumulation is provided in **Appendix A.3**.

6.1.1 Container Management

All containers must be labeled with a label indicating what the waste is (i.e., refined product/ water, contaminated soil, etc.) as well as the date that the waste was placed in the container until waste stream determination is completed. Labels must meet D.O.T. (49 CFR part 172) requirements for labeling substance containers for wastes.

Hazardous and NHW labels will be placed on containers following the waste determination process. Waste must be segregated by type of waste. **Appendix A.4** contains waste label examples.

6.1.2 Inspections

In accordance with 40 CFR 265.170-174 waste storage areas that are presumed or determined to be hazardous wastes will be inspected daily using the Waste Inspection Form (**Appendix A.5**). The daily inspection will ensure that all frac tanks and containers are in good condition, roll-off boxes are not leaking and are properly lined and free of liquids. Any totes, drums, pails, or other containers will also be inspected, and discrepancies will be reported to the Company Environmental Specialist

The inspection record forms must be retained for a minimum of 3 years.

7.0 Transportation

The following sections detail the procedures for the transportation of waste off site.

7.1 Transportation On Site

All waste transportation to the staging area is overseen by the Company Environmental Specialist and shall be performed by the authorized and trained personnel.

Bulk Liquids will be collected using vacuum trucks where feasible or pumped directly and transferred to onsite frac tanks or transported for disposal. The vacuum trucks will be visually and continuously monitored by the operator as recovered material is pumped into the tank.

7.2 Manifesting for Transportation Off Site

All shipments of HW or NHW that are generated at the site and offered for transportation over public highways must be accompanied by a uniform HW or NHW manifest.

7.2.1 U.S. Department of Transportation

Prior to transporting HW or offering HW for transportation offsite, each shipment must be labeled in accordance with applicable DOT regulations (49 CFR Part 172, Subpart E) as follows:

- “HAZARDOUS WASTE—Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or EPA”
- DOT proper shipping name
- UN or NA number (49 CFR 172.101)
- Generator’s name and address
- Generator’s EPA ID number
- EPA HW Code(s)
- ASD
- Manifest tracking number

Additionally, each HW shipment must be labeled in accordance with 49 CFR Part 172, Subpart D, as follows:

- Weight
- Sequence (e.g., 1 of 3)
- DOT shipping label

Each package of HW for shipment must be labeled in accordance with 49 CFR Table 172.101 to the DOT hazard classification for that HW, as follows:

- HW that meets the definition of more than one DOT hazard classification must be labeled in accordance with all DOT hazard classifications.
- When two or more HWs with different DOT hazard classifications are packaged within the same packaging or outer enclosure, the outside of the package or outer enclosure must be labeled with all DOT hazard classifications.

7.2.2 Land Disposal Restrictions

When applicable, LDR Notification Forms in accordance with 40 CFR Part 268, must accompany the uniform HW manifest as part of the shipping papers.

LDR Notification Forms are signed by personnel designated each time an applicable waste is shipped offsite.

7.2.3 HW and NHW Manifesting

Offsite shipments of HW and NHW will incorporate the procedures described below.

7.2.3.1 HW Manifesting

Each offsite HW shipment will be accompanied by a Uniform Manifest (EPA Form 8700-22) and must incorporate the following procedures:

- Only properly trained personnel may sign the HW manifest and associated paperwork.
- The manifest must be complete and accurate.
- All copies of the manifest must be legible.
- "Generator's Initial Copy" of the manifest must be retained pending receipt of the "Designated Facility to Generator" copy of the manifest. This copy must indicate the HW Report Management Method Codes in Items 19 and 36. It must be hand-signed in Item 20 by the owner or operator of the designated TSDF that received the HW.

7.2.3.2 NHW Manifesting

Each offsite shipment of soil and debris will be accompanied by a NHW Manifest and must incorporate the following procedure:

- The manifest must be complete and accurate.
- All copies of the manifest must be legible.
- "Generator's/Shipper's Initial Copy" of the manifest must be retained and provided to the Environmental Manager for recordkeeping and filing.

7.3 Recordkeeping

The "Generator's Initial Copy" of the HW manifest must be retained while awaiting receipt of the "Designated Facility to Generator" copy of the manifest. This copy must indicate the HW Report Management Method Codes in Items 19 and 36. It must be hand-signed in Item 20 by the owner or operator of the designated TSDF that received the waste as follows:

- If the hand-signed manifest is not received within 30 days of shipment, the Company Environmental Specialist shall contact the designated facility, and/or the transporter to determine the status of the waste.
- If the signed manifest is not received within 45 days, the Company Environmental Specialist shall file an Exception Report with the EPA Region 3 Regional Administrator including:
    - A cover letter explaining efforts to locate the shipment of waste and results of those efforts.
    - A legible copy of the manifest.

All records, including manifests, must be kept for a minimum of 3 years.

Appendix A.1

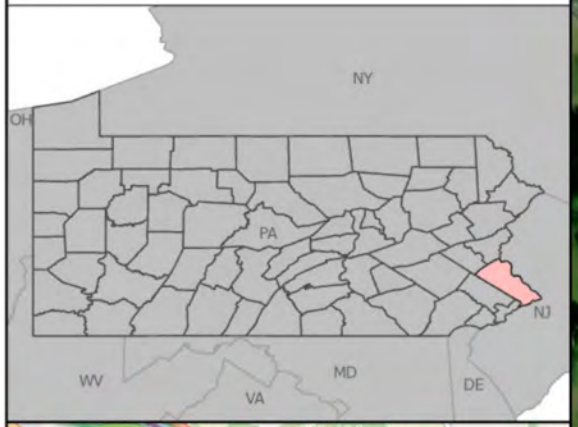
CTEH®

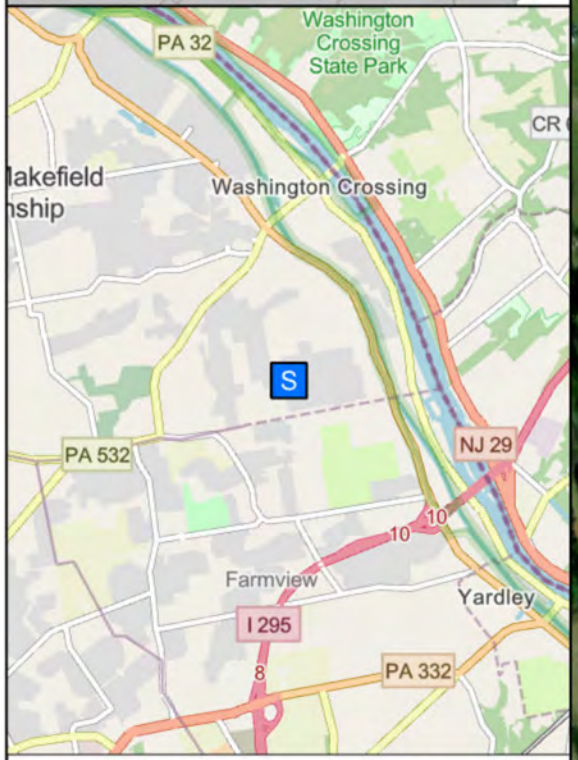
Upper Makefield Response

Incident Location

Washington Crossing, PA | Bucks County

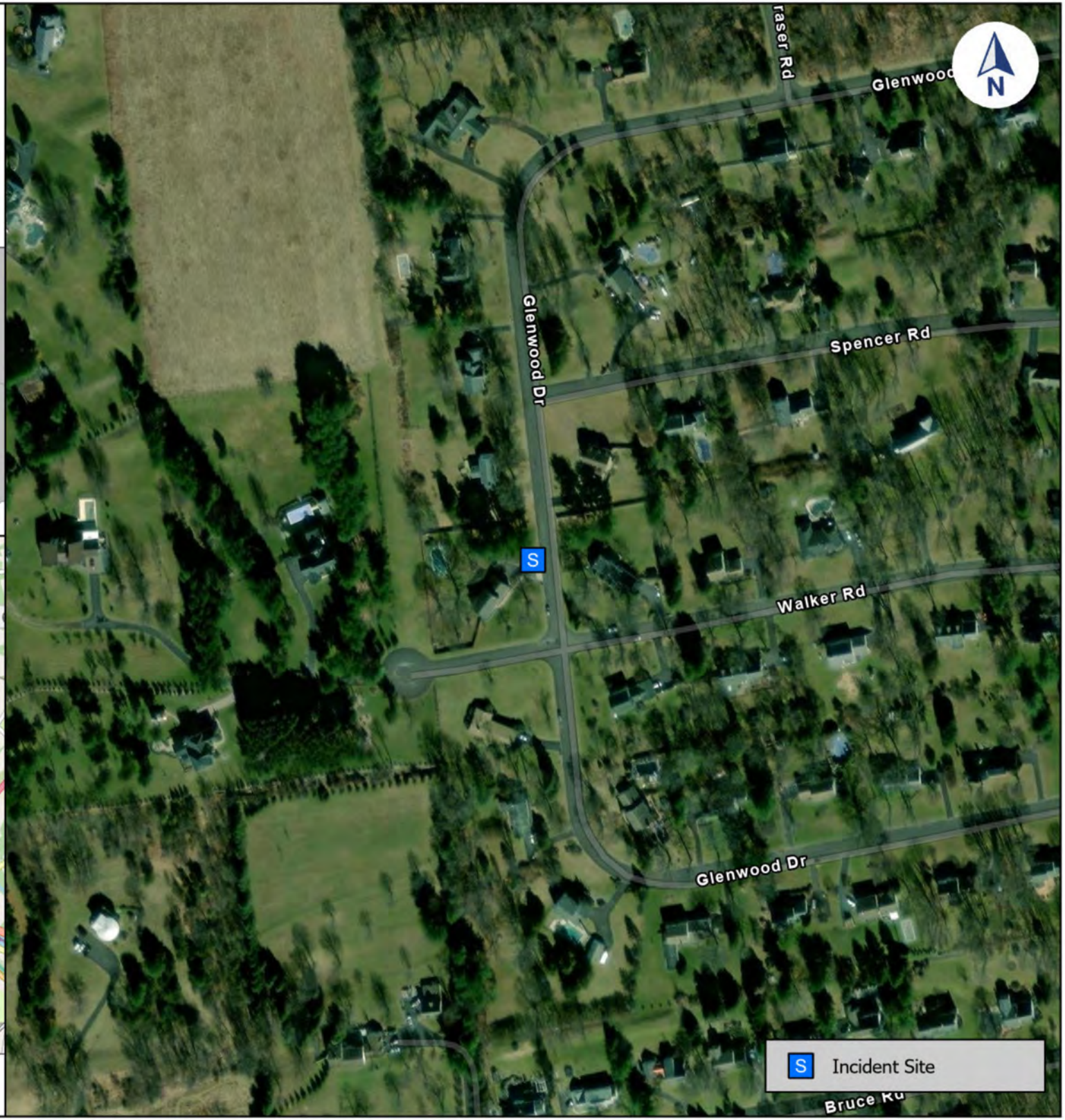
PROJ-051861





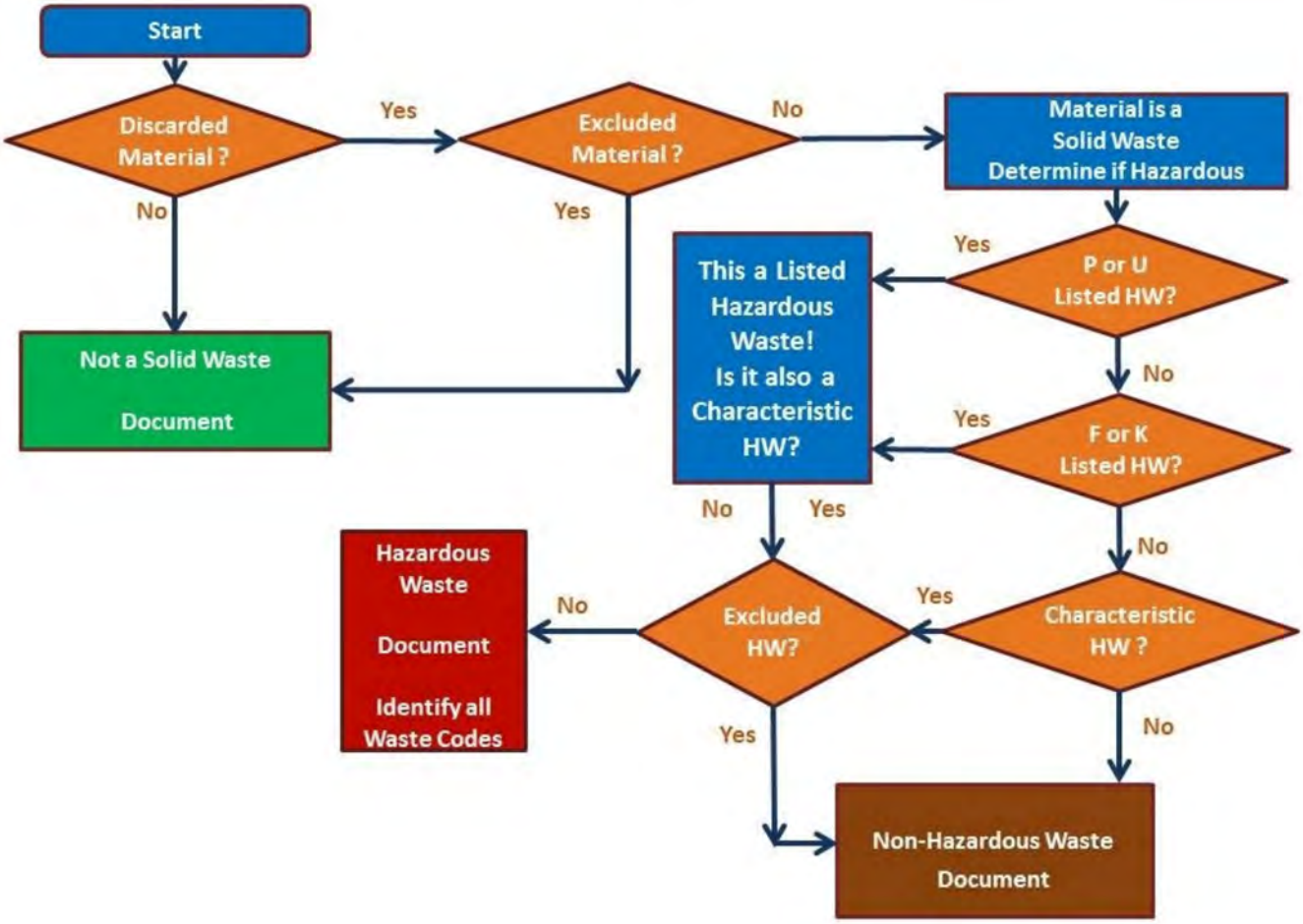
Updated At: 2/15/2025 4:18 PM

Projection: NAD 1983 2011 StatePlane Pennsylvania South FIPS 3702 Ft US



Appendix A.2

Hazardous Waste Determination Flow Chart



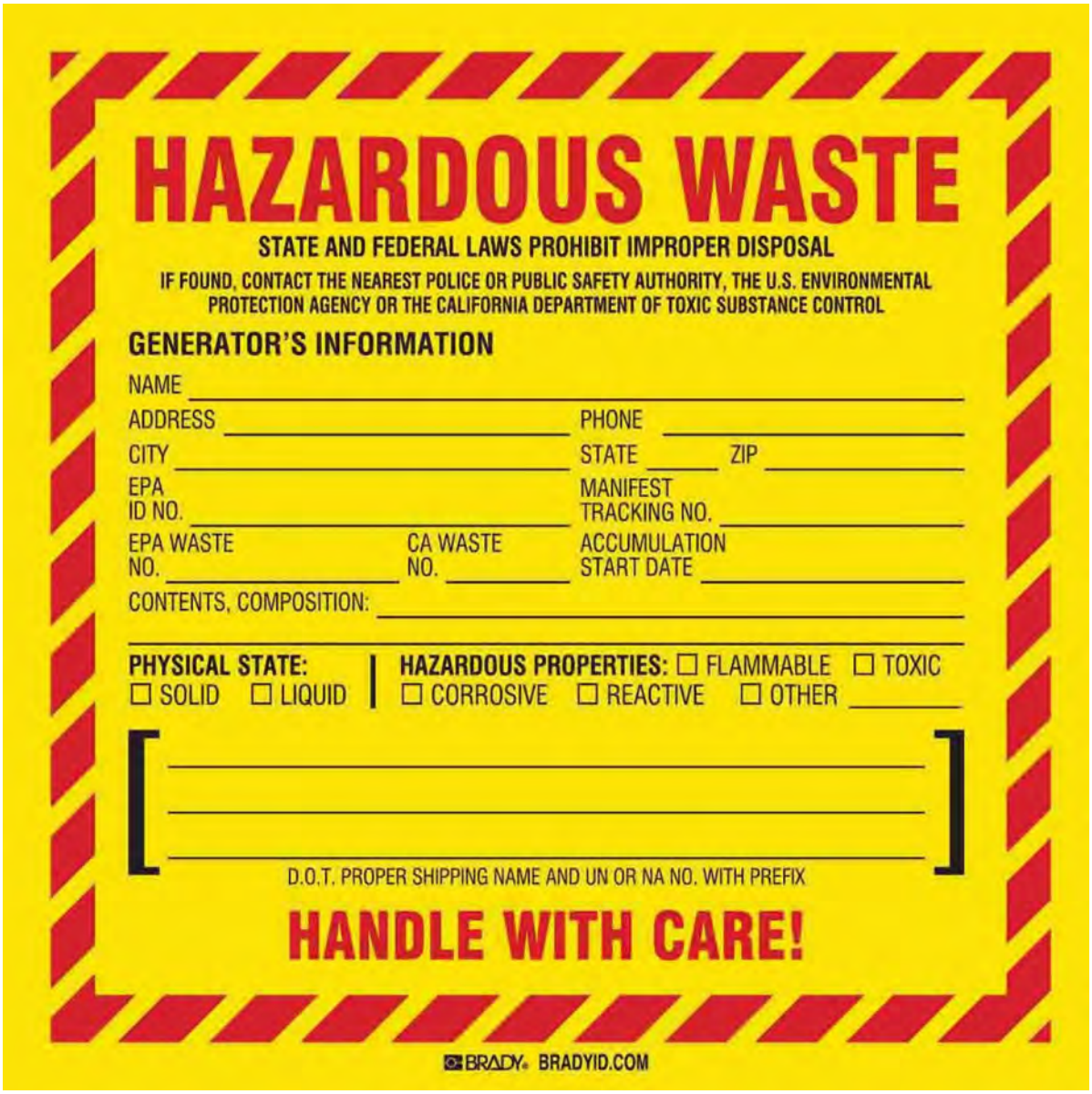
Appendix A.3

Waste Storage Log

Accumulation Start Date	Waste Description	Container Type	Container Number	Storage Location

Appendix A.4

NON-
HAZARDOUS
Waste
OPTIONAL INFORMATION
SHIPPER
ADDRESS
CITY, STATE, ZIP
CONTENTS
NON-HAZARDOUS WASTE
BRADY BRADYID.COM


HAZARDOUS WASTE
STATE AND FEDERAL LAWS PROHIBIT IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY, THE U.S. ENVIRONMENTAL PROTECTION AGENCY OR THE CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCE CONTROL
GENERATOR'S INFORMATION
NAME
ADDRESS
PHONE
CITY
STATE
ZIP
EPA ID NO.
MANIFEST TRACKING NO.
EPA WASTE NO.
CA WASTE NO.
ACCUMULATION START DATE
CONTENTS, COMPOSITION:
PHYSICAL STATE:
☐ SOLID ☐ LIQUID
HAZARDOUS PROPERTIES: ☐ FLAMMABLE ☐ TOXIC
☐ CORROSIVE ☐ REACTIVE ☐ OTHER
D.O.T. PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX
HANDLE WITH CARE!
BRADY BRADYID.COM

THIS CONTAINER
ON HOLD
PENDING ANALYSIS

CONTENTS _____

_____

_____

ORIGIN OF MATERIALS _____

ADDRESS _____

CONTACT _____

DO NOT TAMPER WITH CONTAINER
AUTHORIZED PERSONNEL ONLY

Appendix A.5

Attachment 9

GROUNDWATER & ENVIRONMENTAL SERVICES, INC.

SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR

Sunoco Pipeline

121 Glenwood Drive

Washington Crossing, PA 18977

ANNUAL UPDATE COMPLETED ON (DATE): **02/10/25**

EMERGENCY PHONE NUMBERS:

Local Police 911

Local Fire 911

Local Rescue 911

Local Hospital Name, Phone Number & Address (Map and directions are attached):

Hospital Name	Jefferson Bucks Hospital
Street Address	380 North Oxford Valley Road
City, State, Zip	Langhorne, PA 19047
Phone Number	215/949-5000

National Response Center (NRC): 1-800-424-8802
The NRC should be contacted in the event of a significant chemical release. Once notified, the NRC will activate a federal response to the spill. *Please confirm with the client and project manager to determine if the spill should be reported*.

Poison Control Center: 1-800-222-1222
The Poison Control Center should be contacted in the event of accidental poisoning. They will provide information on immediate treatment for the poisoning.

Project Contact Information:

Role	Name	Phone Number	Cell Phone Number
Site Supervisor	GES Personnel		
Project Manager	Stephanie Grillo	800/426/9871 X3064	610/823-5936
Vice President of Corporate Health and Safety	Kyle Slabik	800/426-9871 x3038	610/256-9788
Client Representative	Brad Fish		610-212-6972

DO NOT TRANSPORT SERIOUSLY INJURED PERSONNEL TO THE HOSPITAL

CALL 911

HOSPITAL ROUTE MAPS

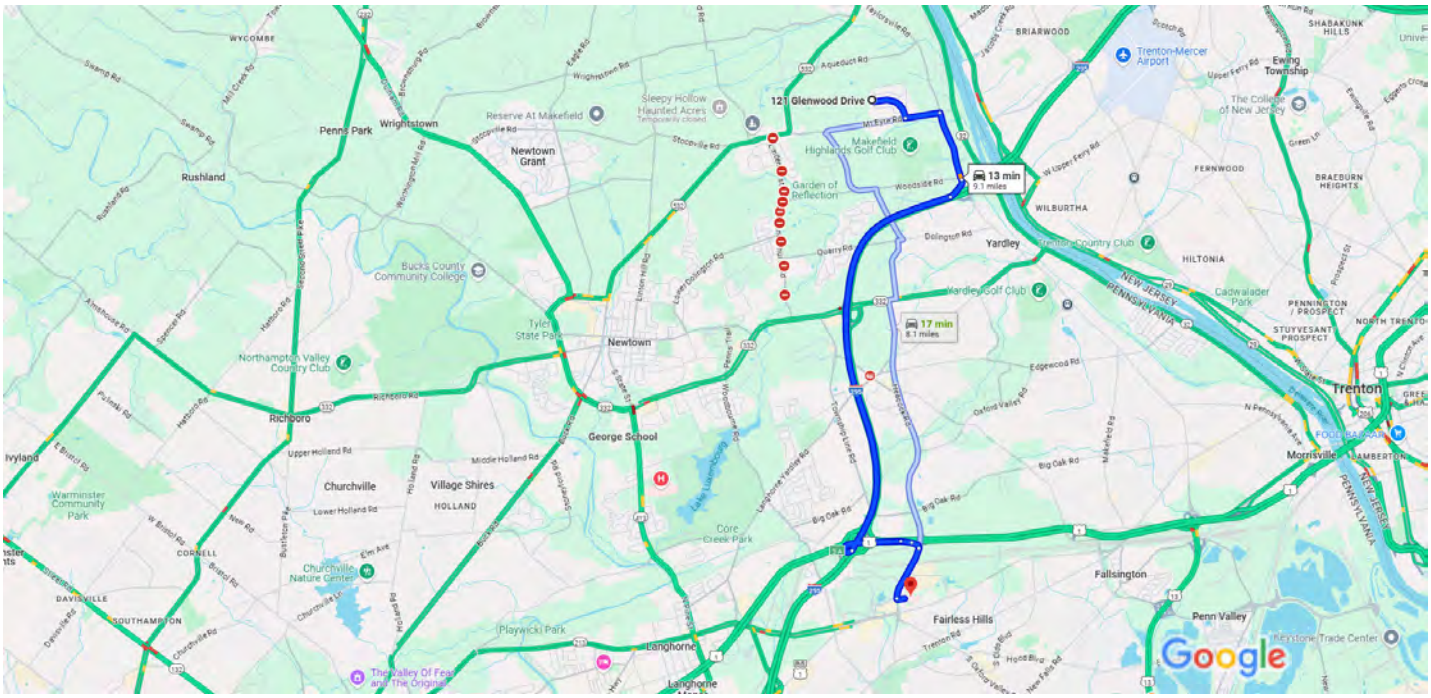
AND

LOCAL GES OFFICE CLINIC MAPS

Google Maps

121 Glenwood Dr, Washington Crossing, PA 18977 to 380 N Oxford Valley Rd, Langhorne, PA 19047

Drive 9.1 miles, 13 min



Map data ©2025 Google 1 mi

121 Glenwood Dr
Washington Crossing, PA 18977

Get on I-295 W in Lower Makefield Township from Walker Rd, Mt Eyre Rd and Taylorsville Rd

5 min (2.1 mi)

1. Head south on Glenwood Dr toward Walker Rd

112 ft

2. Turn left at the 1st cross street onto Walker Rd

0.5 mi

3. Turn left onto Mt Eyre Rd

0.4 mi

4. Turn right onto Taylorsville Rd

0.9 mi

5. Use the right lane to take the ramp onto I-295 W

0.3 mi

Continue on I-295 W to Falls Township. Take the Oxford Valley Rd exit from US-1 N

6 min (6.2 mi)

6. Merge onto I-295 W

5.1 mi

7. Take exit 5 A to merge onto US-1 N toward Trenton

0.9 mi

8. Take the Oxford Valley Rd exit

0.1 mi

9. Slight right to merge onto N Oxford Valley Rd

0.1 mi

Continue on N Oxford Valley Rd. Drive to S Buckstown Rd

3 min (0.8 mi)

10. Merge onto N Oxford Valley Rd

0.7 mi

11. Turn left onto S Buckstown Rd

0.1 mi

380 N Oxford Valley Rd
Langhorne, PA 19047

Live traffic	*Fast*	*Slow*

1.0 INTRODUCTION

1.1 APPROVALS

	Name	Title	Date	Signature
Prepared By	Joan Amodeo	Tech Operations Administrator	02/10/2025	Joan S. Amodeo
Reviewed By (Project Manager)	S. Grillo	Project Manager	2/10/25	SRG
Approved By	K. Slabik	Regional HSO	2/11/25	KS

1.2 SITE BACKGROUND

Project Name	Sunoco Pipeline
Site Address	121 Glenwood Drive, Washington Crossing
Nearest Intersection	Walker
Township/Municipality	Upper Makerfield Township
County	Bucks
Additional Information	

1.3 SCOPE OF WORK

Task 1 – Potable Sampling

Task 2 – Product Recovery

Task 3 – Drilling

Task 4 — Waste handling

Task 5 –

Task 6 –

Task 7 –

Task 8 –

Task 9 –

Task 10 –

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Responsibility	Name	Task Description
Project Manager	Stephanie Grillo	Oversee and coordinate all budget and technical aspects for the project
Regional Health & Safety Manager/Officer	Kyle Slabik	Coordinate all health and safety operations for the project site
Site Supervisor	GES Personnel	Oversee and coordinate all health and safety aspects from the project site

ACCIDENT / INCIDENT MEDICAL SURVEILLANCE

As a follow-up to a work-related injury, all employees are entitled and encouraged to seek medical attention. All accidents and potential exposures must be reported **immediately** to the office leadership and / or RHSSE, who will coordinate with CHSSE to arrange for appropriate medical attention. Depending on the type of incident, it may be critical to perform tests within 24 to 48 hours. *Failure to report an injury or incident immediately will result in disciplinary action*. The *GES Incident/Injury Case Management Procedure* can be found in **Attachment I**.

Events surrounding Near Loss incidents will be recorded in the daily log and documented in accordance with the GES Incident Reporting Procedures.

3.0 HAZARD ASSESSMENT

Job Loss Analyses (JLAs) are required for most site activities. Each JLA must identify and quantify the health and safety hazards associated with each task and site operation, and to evaluate risks to workers. Using this information, appropriate control methods are selected to mitigate or (preferably) eliminate the identified risks.

Site Security

- Do not permit anyone who is not properly trained and outfitted with the appropriate PPE to enter the Exclusion or Contamination Reduction Zones (this includes GES personnel, clients, etc.)
- Use caution tape or barricade fencing where warranted to keep unauthorized personnel from entering the work area.
- On sites where it is believed that security is an issue, two employees will be used for all field work. The "buddy-system" will be in place and the two employees will be in constant communication and within each other's line of sight. There will be a cellular phone available to call 911 if a violent condition presents itself.
- When acts of violence occur or when an employee(s) feels that they are being placed in a threatening position they must immediately leave the site.

- All potential acts of violence or threats by non-GES personnel must be immediately reported to the Office leadership and / or Project Manager and Regional HSSE. The situation will be discussed to determine future action on the site in question.
- If any GES employee notices suspicious persons or activities in a GES office or in the vicinity of a work area, he or she should immediately report the observation to his or her supervisor or Regional Operations Manager.

FIRE/EXPLOSION

If a fire is observed in the incipient phase (i.e., when it begins) and if the site personnel witnessing the fire feel secure in attempting to control the fire, the individual can attempt to extinguish the fire by using the onsite fire extinguisher. The fire extinguisher should be a 10 or 20 pound (lb.) dry chemical, Class A, B, and C extinguisher and is adequate for paper and wood based products (A), flammable and combustible liquids (B), and electrical (C) type fires.

If there is no fire extinguisher available or if site personnel do not feel secure in attempting to extinguish the fire, site personnel shall perform the following:

- Secure the site, if possible.
- Evacuate the area using the nearest safe pathway from the area.
- Proceed to the nearest phone and call 911 and provide the emergency operator all required information. This will activate the emergency response system.

If more than one individual is on the site team, the individual activating the evacuation plan shall verbally communicate to the other site personnel that there is an emergency condition and that they should evacuate from the work area. If contact cannot be made verbally with the other site personnel, any of the following systems can be used as long as the system is audible above background noise. The system can be the site vehicle horn, a whistle, an air horn, or other acceptable device. The system used for initiating an evacuation from the site shall be discussed during the tailgate meeting with the other site personnel prior to beginning the workday. The system that is decided upon shall be documented in the site logbook.

If an explosion or other unsafe condition occurs that the site supervisor had determined will place the other site personnel at risk, then the evacuation system described above should be activated immediately.

GES WORK PERMITS

Work permits will be required for Confined Space Entry, Hot Work and Lockout/Tag out as well as any Federal and client permitted activity. These permits must be obtained from the Project Manager or RHSSE prior to site work.

GENERAL SITE RULES

The following general site rules apply to all personnel while on the site:

- Before daily site operations begin, the daily site safety checklist will be completed, the subcontractor’s training documentation will be reviewed (as required by section 3 of this plan), and a pre-entry briefing will be held to review the site's health and safety plan concerns and emergency procedures. This meeting will be registered in this Health and Safety Plan. Attendance will be documented.

- One site worker will be assigned to keep the daily log for all health and safety-specific site activities, unless otherwise specified.

- All personnel will wear steel-toe safety boots. Hard hats will be worn when working near heavy equipment (drill rigs, excavating equipment, etc.), when individuals are working with overhead hazards present, when required in the Job Loss Analysis (JLA), or when required by the client.

- Eye protection and high visibility clothing/reflective safety vests will be donned at all times while on site.

- Possession of alcohol or illegal substances on the job site or consumption during hours of site operations is strictly prohibited.

- Food and/or beverages are not permitted in the site's Exclusion or Contamination Reduction Zones. Food and/or beverages will be permitted in the Support Zone, if proper decontamination procedures are being followed.

- Smoking, including the use of e-cigarettes, is not permitted on any site. Chewing tobacco, snuff, application of cosmetics and/or lip balm is not permitted in the site's Exclusion or Contamination Reduction Zones.

- A change in level of protection will be based on air monitoring equipment readings taken in the breathing zone.

- Field personnel will use air monitoring equipment and not their nose to determine site contamination (i.e., sniffing sampled soils or water in jars, confined spaces, open bore holes or trenches, etc.). Odors detected during the course of standard operating procedures, however, should be noted in the daily log.

- Field personnel should not stand with their head directly over a well when it is being opened.

- First Aid Kit(s) and Fire Extinguisher(s) will be available in all company vehicles and/or within 50 feet of the working area.

Note: Hot work activities require that a person onsite shall act as a fire watch with a Class A, B, C dry chemical extinguisher within 10 feet of the activity, and all necessary work requirements are satisfied.

Any revisions to the final Site-Specific Health and Safety Plan must be reviewed by the Project/Case Manager and approved by RHSSE or a Principal Hydrogeologist, at a minimum.

ATTACHMENT A

SITE MAPS

N:\Blacksburg\Projects\Energy Transfer\WashingtonCrossing\GIS\WashingtonCrossingER.aprx - Scale 1:5,400 - 2/6/2025 12:20 PM - jbarnard - WGS 1984 Web Mercator Auxiliary Sphere - Layout -SM

6 Fraser Rd.
5 Fraser Rd.
144 Glenwood Dr.
149 Glenwood Dr.
148 Glenwood Dr.
220 Bruce Rd.
142 Glenwood Drive
140 Glenwood Dr.
138 Glenwood Dr.
135 Glenwood Dr.
129 Glenwood Dr.
136 Glenwood Dr.
134 Glenwood Dr.
Fraser Rd.
Glenwood Dr.
Taylorsville Rd.
Bruce Rd.
127 Glenwood Dr.
128 Glenwood Dr.
114 Spencer Rd.
110 Spencer Rd.
108 Spencer Rd.
106 Spencer Rd.
214 Bruce Rd.
125 Glenwood Dr.
Spencer Rd.
107 Spencer Rd.
105 Spencer Rd.
104 Spencer Rd.
113 Spencer Rd.
103 Spencer Rd.
102 Spencer Road
101 Spencer Rd
122 Walker Rd.
124 Glenwood Dr.
115 Spencer Rd.
104 Crestwood Rd.
209 Bruce Rd.
123 Glenwood Dr.
120 Walker Rd.
118 Walker Rd.
210 Bruce Rd.
124 Walker Rd. (Access Denied)
126 Walker Rd.
207 Bruce Rd.
121 Glenwood Dr.
128 Walker Rd.
Walker Rd.
121 Walker Rd.
102 Crestwood
208 Bruce Rd.
104 Beechwood Dr
150 Walker Rd.
140 Walker Rd.
123 Walker Rd.
119 Glenwood Dr.
127 Walker Rd.
111 Walker Dr.
112 Walker Rd.
135 Walker Rd.
106 Glenwood Dr.
109 Walker Rd.
110 Walker Rd
101 Beechwood Dr.
111 Beechwood Dr.
108 Walker Road
107 Walker Rd.
110 Glenwood Dr
Glenwood Dr.
106 Walker Dr.
116 Beechwood Dr
107 Glenwood Dr.
Beechwood Dr.
204 Bruce Rd.
104 Beechwood Dr
202 Bruce Rd.
115 Bruce Rd.
104 Walker Rd.
113 Bruce Rd.
1079 Mt Eyre Rd
107 Bruce Rd.
103 Bruce Rd.
Bruce Rd.
105 Bruce Rd.
122 Bruce Rd.
120 Bruce Rd.
114 Bruce Rd.
Bruce Rd.
99 Bruce Rd.
110 Bruce Rd.
Mt Eyre Rd.
102 Bruce Rd.
Mt Eyre Rd.
Mt Eyre Rd.
Dyers Ln
Mt Eyre Rd.

Site Map

Sunoco Pipeline
Upper Makefield Township,
Washington Crossing, PA

Drawn **J.B.**
Designed **S.G.**
Approved **X.X.**

Date **2/6/25**
Figure **X.X.**

N

Scale In Feet (Approximate)
0 450

GES
Groundwater & Environmental Services, Inc.

ATTACHMENT B

EXPOSURE MONITORING PROGRAM

FOR THE CONTAMINANTS OF CONCERN

EXPOSURE MONITORING PROGRAM

REAL-TIME MONITORING

Photo-ionization Detector (PID): Real-time monitoring for volatile organic compounds (VOCs) will be conducted using a photo-ionization detector (PID). The PID will be used to monitor employee breathing zones during all invasive activities. **Table 1** lists PID action levels and response requirements

Combustible Gas Indicator/Oxygen Level Meter: Real-time monitoring for combustible gases and oxygen levels will be conducted using a Combustible Gas Indicator (CGI)/Oxygen Level Meter. The CGI will test for the presence of combustible gases by continuously monitoring the lower explosive limit (LEL) of organic vapors. The CGI will be used to monitor the LEL prior to, and during, Confined Space (CS) entries and during work near an excavation in contaminated soil. The Oxygen Level Meter will detect an oxygen-deficient or oxygen-enriched atmosphere, and will be used prior to, and during, all CS entry activities. If ionizing radiation is suspected at a site, a Geiger counter will be used to measure exposure under guidance of a Health Physicist. **Table 2** lists CGI, Oxygen Level Meter, and ionizing radiation action levels and response requirements.

Depending on the Contaminants of Concern, other forms of real-time monitoring equipment may be required to quantify chemical hazards and protect workers from exposure. These may include, but are not limited to bio-aerosol monitors, detector tubes, dust monitors, FROG meters, etc.

- Calibration of Real-Time Monitoring Equipment: Monitoring and calibration protocols will be performed in accordance with the manufacturer's guidelines. Calibration will be performed, at a minimum, prior to each day's use.

- Calibration logs will be maintained by the field personnel performing the calibrations.

ACTION LEVELS

Tables 1 and 2 list the action levels and response requirements for a PID and CGI/Oxygen Level Meter. Changing levels of protection, upgrading respiratory protection, or changing work practices is based on maintaining the upper limit of the action level for approximately **10 minutes** sustained in the breathing zone (i.e., a non-transient reading) or at the discretion of the Site Supervisor. If changes in protection levels are required, the Site Supervisor will, stop the job, notify the Project Manager who will contact Regional Engineering and CHSSE to determine if administrative or engineering controls can be implemented to mitigate or eliminate the hazard.

Table 1 provides action levels that must be complied with when petroleum products such as gasoline are the known site contaminants.

Tables 4 & 5 provide space to document site-specific action levels, should the site contain other potential site contaminants. Action levels must be determined by consultation with/approval by CHSSE, based on established chemical exposure limits and monitoring instrument response factors.

TABLE 1 OVM ACTION LEVELS	
Meter Response (Breathing Zone)	**Action Required**
PID response <5 units above background	No respiratory protection required (i.e., Level D)
PID response >5 units above background (Bkgd.) and < 50 units above Bkgd.	Stop work. Investigate the cause of elevated VOC measurements. Contact the Project Manager or office and determine if administrative or engineering controls can be implemented to mitigate or eliminate the elevated readings. If not medically qualified to wear respiratory protection, leave work zone. If the elevated readings cannot be reduced below 5 units above background or eliminated, and if medically qualified, fit tested and trained to wear respiratory protection, then upgrade to Modified Level C, half- face respiratory protection.
PID response >50 units and < 250 units above Bkgd.	Stop work. Investigate the cause of elevated VOC measurements. Contact the Project Manager or office and determine if administrative or engineering controls can be implemented to mitigate or eliminate the elevated readings. If not medically qualified to wear respiratory protection, leave work zone. If the elevated readings cannot be reduced below 5 units above background or eliminated, and if medically qualified, fit tested and trained to wear respiratory protection, then upgrade to Modified Level C, full- face respiratory protection.
PID response > 250 above Bkgd.	Retreat from site [1,2]

[1] If a retreat becomes necessary, CHSSE or Regional Engineering will be consulted in regard to adding mechanical ventilation or possible changes in work practices. Work will not resume until appropriate corrective measures are implemented.

[2] Because direct reading instruments cannot indicate or are not compound specific, concentrations shown on the instruments shall be related to units above background and not parts per million (ppm).

TABLE 2 CGI/O2/RADIATION LEVEL ACTION LEVELS	
Meter Response	**Action**
CGI response < 10 % LEL	Continue normal operations.
CGI response > 10 % and <20 % LEL	Eliminate all sources of ignition from the work area; implement continuous monitoring. However if work is being done in a confined space, retreat from work area.[1]
CGI response > 20 % LEL	Discontinue operations; allow to vent; retreat from work area.[1]
Oxygen level < 19.5%	Retreat from work area. [1]
Oxygen level > 23.5%	Retreat from work area. [1]
3X background to <2 mR/hr.	Radiation above background levels (normally 0.01-0.02 mR/hr.) signifies possible source(s) radiation present. Continue investigation with caution. Perform thorough monitoring. **Consult with a health physicist**.
>2mR/hr.	Potential radiation hazard. Evacuate site. Continue investigation only upon the advice of a health physicist

[1] If a retreat becomes necessary, CHSSE or Regional Engineering will be consulted in regard to adding mechanical ventilation or possible changes in work practices. Work will not resume until appropriate corrective measures are implemented.

TABLE 3
Petroleum Materials of Concern

Contaminant	OSHA TWA (ppm)	ACGIH TLV (ppm)	Hazards	Entry Routes	IP
Benzene	1	10	1,2,4,5,6,9	Inh, Abs, Ing, Con	9.24
Xylene	100	100	1,2,3,4,5,6,7,10	Inh, Abs, Ing, Con	8.56
Ethylbenzene	100	100	1,2,3,10	Inh, Ing, Con	8.76
Toluene	200	50	1,2,3,4,5,7,10	Inh, Abs, Ing, Con	8.82

TWA = Time Weighted Average in parts per million (ppm)
C = Ceiling
IP = Ionization Potential

1 = irritant to skin
2 = irritant to eyes
3 = irritant to respiratory system
4 = may cause headache
5 = may cause dizziness, lightheadedness
6 = may cause nausea and vomiting
7 = may cause liver and kidney damage
8 = irritant to GI tract
9 = carcinogen/possible carcinogen
10 = may cause damage to CNS

TABLE 4
Inorganic Gases and Vapors of Concern

Contaminant	OSHA TWA (ppm)	ACGIH TLV (ppm)	Hazards	Entry Routes	IP

TWA = Time Weighted Average in parts per million (ppm)
C = Ceiling
IP = Ionization Potential

1 = irritant to skin
2 = irritant to eyes
3 = irritant to respiratory system
4 = may cause headache
5 = may cause dizziness, lightheadedness
6 = may cause nausea and vomiting
7 = may cause liver and kidney damage
8 = irritant to GI tract
9 = carcinogen/possible carcinogen
10 = may cause damage to CNS

Note: Consult standard reference manuals for air concentration/toxicity data. Action level depends on PEL/REL/TLV. These Action Levels, if not defined by regulation, is some percent (usually 50%) of the applicable PEL/REL/TLV. That number must also be adjusted to account for instrument response factors.

TABLE 5
***Site Specific hazards (chemicals) of Concern**

Contaminant	OSHA TWA (ppm)	ACGIH TLV (ppm)	Hazards	Entry Routes	IP

TWA = Time Weighted Average in parts per million (ppm)

C = Ceiling

IP = Ionization Potential

1 = irritant to skin
2 = irritant to eyes
3 = irritant to respiratory system
4 = may cause headache
5 = may cause dizziness, lightheadedness
6 = may cause nausea and vomiting
7 = may cause liver and kidney damage
8 = irritant to GI tract
9 = carcinogen/possible carcinogen
10 = may cause damage to CNS

Note: Consult standard reference manuals for air concentration/toxicity data. Action level depends on PEL/REL/TLV. These Action Levels, if not defined by regulation, is some percent (usually 50%) of the applicable PEL/REL/TLV. That number must also be adjusted to account for instrument response factors.

ATTACHMENT C

SITE SAFETY DATA SHEETS (SDS)

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

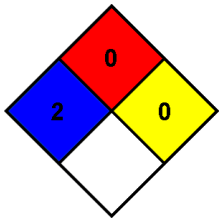
Full text of H-phrases:

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

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	Fish - Morone saxatilis - Juvenile	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

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.

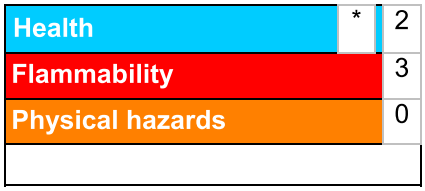
Turkey : This material is listed or exempted.

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.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

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 6.26
Revision Date 11/17/2024
Print Date 11/18/2024

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

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 liquids (Category 2), H225
Skin irritation (Category 2), H315

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Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure, Inhalation (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

Pictogram

Signal Word: Danger

Hazard Statements

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 if inhaled.
H401	Toxic to aquatic life.
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.
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 mist or vapors.
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.

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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

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.

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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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
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
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.

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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.

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. Table Z-1-A Limits for Air Contaminants (1989 vacated values)
		STEL	150 ppm 560 mg/m3	USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)
		TWA	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z37.12-1967		

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		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 2023 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		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

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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.

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 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: 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 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: 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
Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

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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 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	4.4 °C (39.9 °F) - closed cup - closed cup
h)	Evaporation rate	No data available
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	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	Not classified as explosive.

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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
halogen-halogen compounds
uranium hexafluoride
organic nitro compounds
Violent reactions possible with:
Strong acids
Strong oxidizing agents
sulfur
with
Heat.

10.4 Conditions to avoid

Warming.
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 - male - 5,580 mg/kg
(Directive 67/548/EEC, Annex V, B.1.)
LC50 Inhalation - Rat - male - 4 h - 25.7 mg/l - vapor

(OECD Test Guideline 403)
LD50 Dermal - Rabbit - male - > 5,000 mg/kg
Remarks: (ECHA)

Skin corrosion/irritation
Skin - Rabbit
Result: irritating - 4 h
(Regulation (EC) No. 440/2008, Annex, B.4)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye 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: Regulation (EC) No. 440/2008, Annex, B.13/14 (Ames test)
Result: negative

Test Type: Chromosome aberration test
Species: Rat
Cell type: Bone marrow
Application Route: Intraperitoneal

Result: negative
Remarks: (ECHA)

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.

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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
Inhalation - May cause drowsiness or dizziness. - Central nervous system
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure
Inhalation - May cause damage to organs through prolonged or repeated exposure.
- Central nervous system
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Aspiration hazard
Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 625 mg/kg - LOAEL (Lowest observed adverse effect level) - 1,250 mg/kg

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 Remarks: (ECHA)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Oncorhynchus kisutch (coho salmon) - 1.39 mg/l - 40 d Remarks: (ECHA)

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Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	NOEC - Ceriodaphnia dubia (water flea) - 0.74 mg/l - 7 d (US-EPA)

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 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: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

The life science business of Merck KGaA, Darmstadt, Germany
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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

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Toluene	108-88-3	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 : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

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

Toluene 108-88-3 >= 90 - <= 100 %

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 112 (40 CFR 61):

Toluene 108-88-3 >= 90 - <= 100 %

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489):

Toluene 108-88-3 >= 90 - <= 100 %

Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

Toluene 108-88-3 >= 90 - <= 100 %

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

Toluene 108-88-3 >= 90 - <= 100 %

This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

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Toluene	108-88-3	>= 90 - <= 100 %

This product contains the following priority pollutants related to the U.S. Clean Water Act:

Toluene	108-88-3	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

Toluene	108-88-3

Pennsylvania Right To Know

Toluene	108-88-3

Maine Chemicals of High Concern

Toluene	108-88-3

Vermont Chemicals of High Concern

Toluene	108-88-3

Washington Chemicals of High Concern

Toluene	108-88-3

California Prop. 65

WARNING: This product can expose you to chemicals including Toluene, which is/are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

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

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: 6.26 Revision Date: 11/17/2024 Print Date: 11/18/2024

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

Version 6.13
Revision Date 09/07/2024
Print Date 09/08/2024

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

1.1 Product identifiers

Product name : Ethylbenzene

Product Number : 296848
Brand : Sigma-Aldrich
Index-No. : 601-023-00-4
CAS-No. : 100-41-4

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 liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Specific target organ toxicity - repeated exposure (Category 2), hearing organs, H373

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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

Pictogram

Signal Word	Danger

Hazard Statements

H225	Highly flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H373	May cause damage to organs (hearing organs) through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Precautionary Statements

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 mist or vapors.
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 + 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.
P314	Get medical advice/ attention if you feel unwell.
P331	Do NOT induce vomiting.
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.
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

The life science business of Merck KGaA, Darmstadt, Germany
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Formula	:	C_8H_{10}
Molecular weight	:	106.17 g/mol
CAS-No.	:	100-41-4
EC-No.	:	202-849-4
Index-No.	:	601-023-00-4

Component	Classification	Concentration
ethylbenzene		
	Flam. Liq. 2; Acute Tox. 4; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H332, H373, H304, H401, H412	<= 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. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Carbon dioxide (CO2) Foam Dry powder

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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
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.
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. Keep away from heat and sources of ignition.

hygroscopic

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
ethylbenzene	100-41-4	TWA	100 ppm 435 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125 ppm 545 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		STEL	30 ppm 130 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	5 ppm 22 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	150mg/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

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8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Preventive skin protection recommended. 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
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: 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 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: 0.4 mm
Break through time: 10 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds
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 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.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	aromatic
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point: -94.9 °C (-138.8 °F) at 101.3 hPa - (ECHA)
f)	Initial boiling point and boiling range	136.1 °C 277.0 °F at 1,013.3 hPa
g)	Flash point	22.0 °C (71.6 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 6.7 %(V) Lower explosion limit: 1 %(V)
k)	Vapor pressure	9.52 hPa at 20 °C (68 °F) - OECD Test Guideline 104
l)	Vapor density	No data available
m)	Density	0.87 g/cm3 at 20 °C (68 °F)
	Relative density	0.86 - 0.8720 °C
n)	Water solubility	0.2 g/l at 25 °C (77 °F) - Regulation (EC) No. 440/2008, Annex, A.6 - slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 3.6 at 20 °C (68 °F) - Regulation (EC) No. 440/2008, Annex, A.8 - Bioaccumulation is not expected.
p)	Autoignition temperature	430 °C (806 °F) at 1,013 hPa
q)	Decomposition temperature	No data available
r)	Viscosity	0.773 mm2/s at 20 °C (68 °F) - OECD Test Guideline 114 - 0.641 mm2/s at 40 °C (104 °F) - OECD Test Guideline 114 -
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Surface tension	71.2 mN/m at 0.058g/l at 23 °C (73 °F) - Surface tension

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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:
Strong oxidizing agents
rubber
various plastics

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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 3,500 mg/kg
Remarks: (ECHA)
LC50 Inhalation - Rat - male - 4 h - 17.8 mg/l - vapor

Remarks: (ECHA)
LD50 Dermal - Rabbit - 15,433 mg/kg
Remarks: (RTECS)

Skin corrosion/irritation
Skin - Rabbit
Result: Moderate skin irritation - 24 h
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation
Remarks: (ECHA)

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473

The life science business of Merck KGaA, Darmstadt, Germany
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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: Bone marrow
Application Route: Oral
Method: OECD Test Guideline 474
Result: negative

Test Type: unscheduled DNA synthesis assay
Species: Mouse

Application Route: Inhalation
Method: OECD Test Guideline 486
Result: negative

Carcinogenicity

IARC:	2B - Group 2B: Possibly carcinogenic to humans (ethylbenzene)
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
May cause damage to organs through prolonged or repeated exposure.
- hearing organs
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Aspiration hazard
Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 28 d - NOAEL (No observed adverse effect level) - 75 mg/kg

RTECS: DA0700000
Central nervous system depression, Nausea, Headache, Vomiting, Ataxia., Tremors
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:

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CNS disorders
Tiredness
Drowsiness
Dizziness
Convulsions
Headache
narcosis

Handle in accordance with good industrial hygiene and safety practice.

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) - 4.2 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 1.8 - 2.4 mg/l - 48 h (US-EPA)
Toxicity to algae	static test EC50 - Pseudokirchneriella subcapitata (green algae) - 3.6 mg/l - 96 h (US-EPA)
Toxicity to bacteria	EC50 - Photobacterium phosphoreum - 9.68 mg/l - 30 min Remarks: (IUCLID)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: ca.79 % - Readily biodegradable. (ISO 14593)

12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

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

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

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: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene
Reportable Quantity (RQ): 1000 lbs
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1175 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHYLBENZENE

IATA

UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene

SECTION 15: Regulatory information

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
ethylbenzene	100-41-4	1000	1000
ethylbenzene	100-41-4	100	100 (F003)

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 : Fire Hazard
Chronic Health Hazard

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

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

ethylbenzene 100-41-4 >= 90 - <= 100 %

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 112 (40 CFR 61):

ethylbenzene 100-41-4 >= 90 - <= 100 %

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489):

ethylbenzene 100-41-4 >= 90 - <= 100 %

Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

ethylbenzene 100-41-4 >= 90 - <= 100 %

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

ethylbenzene 100-41-4 >= 90 - <= 100 %

This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

ethylbenzene 100-41-4 >= 90 - <= 100 %

This product contains the following priority pollutants related to the U.S. Clean Water Act:

ethylbenzene 100-41-4 >= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

ethylbenzene 100-41-4

Pennsylvania Right To Know

ethylbenzene 100-41-4

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

ethylbenzene 100-41-4

Washington Chemicals of High Concern

ethylbenzene 100-41-4

California Prop. 65

WARNING: This product can expose you to chemicals including ethylbenzene, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

The life science business of Merck KGaA, Darmstadt, Germany
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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

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: 6.13 Revision Date: 09/07/2024 Print Date: 09/08/2024

The life science business of Merck KGaA, Darmstadt, Germany
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Xylenes, Reagent Grade

SECTION 1: Identification of the substance/mixture and of the supplier

Product name: **Xylenes, Reagent Grade**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25629**

Recommended uses of the product and restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific, Inc
9 Barnhart Drive, Hanover, PA 17331
(717) 632-1291

Supplier Details:

Fisher Science Education
6771 Silver Crest Road, Nazareth, PA 18064
(724)517-1954

Emergency telephone number:

Fisher Science Education
Emergency Telephone No.: 800-535-5053

SECTION 2: Hazards identification

Classification of the substance or mixture:

Flammable
Flammable liquids, category 3

Irritant
Acute toxicity (oral, dermal, inhalation), category 4
Skin irritation, category 2

Environmentally Damaging
Chronic hazards to the aquatic environment, category 2

Acute hazards to the aquatic environment, category 2
Flam. Liq. 3.
Acute inhalation tox. 4.
Acute Dermal Tox. 4.
Skin Irrit. 2.
Aquatic Acute 2.
Aquatic Chronic 2.

Signal word: Warning

Hazard statements:

Flammable liquid and vapour.
Harmful in contact with skin.
Harmful if inhaled.
Causes skin irritation.
Toxic to aquatic life with long lasting effects.

Precautionary statements:

If medical advice is needed, have product container or label at hand.
Keep out of reach of children.
Read label before use.
Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Avoid release to the environment.
Wear protective gloves/protective clothing/eye protection/face protection.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/light/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Wash skin thoroughly after handling.
Use only outdoors or in a well-ventilated area.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
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.
Specific measures (see supplemental first aid instructions on this label).
If skin irritation occurs: Get medical advice/attention.
Take off contaminated clothing and wash before reuse.
In case of fire: Use agents recommended in section 5 for extinction.
Collect spillage.
Store in a well ventilated place. Keep cool.
Dispose of contents and container to an approved waste disposal plant.

Other Non-GHS Classification:

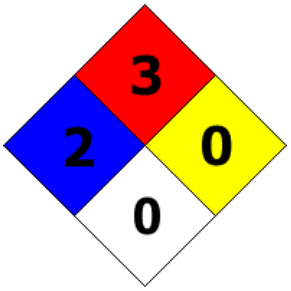
WHMIS

D2A

D2B

B2

NFPA/HMIS



NFPA SCALE (0-4)

HMIS RATINGS (0-4)

SECTION 3: Composition/information on ingredients

Ingredients:		
CAS 1330-20-7	Xylenes	100 %
		Percentages are by weight

SECTION 4: First aid measures

Description of first aid measures

After inhalation:

Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen. Loosen clothing and place exposed in a comfortable position. Seek medical assistance if cough or other symptoms appear.

After skin contact:

Wash hands and exposed skin with soap and plenty of water. Seek medical attention if irritation persists or if concerned.

After eye contact:

Protect unexposed eye. Flush exposed eye gently using water for 15-20 minutes. Remove contact lenses while rinsing. Seek medical attention if irritation persists or concerned.

After swallowing:

Rinse mouth with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Seek medical attention if irritation, discomfort, or vomiting persists.

Most important symptoms and effects, both acute and delayed:

Irritation. Shortness of breath. Headache. Nausea. Dizziness. Blurred vision. Prolonged or repeated exposure to skin causes defatting and dermatitis.

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention provide SDS document to physician. Physician should treat symptomatically.

SECTION 5: Firefighting measures

Extinguishing media

Suitable extinguishing agents:

Use dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam. Use appropriate foam to blanket release and suppress vapors.

Unsuitable extinguishing agents:

Water may be ineffective.

Special hazards arising from the substance or mixture:

Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated. Vapors may travel to sources of ignition. Vapors may form explosive mixtures with air. Vapors may form an explosive mixture with air. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.

Advice for firefighters:

Protective equipment:

Wear protective eyeware, gloves, and clothing. Refer to Section 8.

Additional information (precautions):

Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing. Cool closed containers exposed to fire with water spray.

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation. Ensure that air-handling systems are operational. Remove all sources of ignition.

Environmental precautions:

Should not be released into environment. Prevent from reaching drains, sewer, or waterway.

Methods and material for containment and cleaning up:

Wear protective eyeware, gloves, and clothing. Refer to Section 8. Always obey local regulations. If necessary use trained response staff or contractor. Evacuate personnel to safe areas. Containerize for disposal. Refer to Section 13. Keep in suitable closed containers for disposal. Remove source from ignition. Absorb with inert material and place in chemical waste container. Ventilate spill area. Have extinguishing agent available in case of fire. Eliminate all ignition sources. Stop or control the leak, if this can be done without undue risk. Use appropriate foam to blanket release and suppress vapors. Control runoff and isolate discharged material for proper disposal.

Reference to other sections: None

SECTION 7: Handling and storage

Precautions for safe handling:

Avoid contact with skin, eyes, and clothing. Follow good hygiene procedures when handling chemical materials. Refer to Section 8. Follow proper disposal methods. Refer to Section 13. Do not eat, drink, smoke, or use personal products when handling chemical substances. Keep away from open flames, sources of ignition, hot surfaces. Use explosion-proof equipment and non-sparking tools.

Conditions for safe storage, including any incompatibilities:

Store in a cool location. Keep away from food and beverages. Protect from freezing and physical damage. Provide ventilation for containers. Keep container tightly sealed. Store away from incompatible materials. Store as flammable. Keep away from open flames, hot surfaces and sources of ignition.

SECTION 8: Exposure controls/personal protection

Control Parameters:	1330-20-7, Xylenes, ACGIH TLV TWA 435 mg/m3. 1330-20-7, Xylenes (o-, m-, p- isomers), OSHA PEL 100 ppm TWA; 435 mg/m3 TWA.
Appropriate Engineering controls:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor and mists below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. Use under a chemical fume hood.
Respiratory protection:	Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. When necessary use NIOSH approved breathing equipment.
Protection of skin:	Select glove material impermeable and resistant to the substance. Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves. Wear protective clothing.

Eye protection: Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses or goggles are appropriate eye protection.

General hygienic measures: Perform routine housekeeping. Wash hands before breaks and immediately after handling the product. Avoid contact with skin, eyes, and clothing. Before rewearing wash contaminated clothing. Work clothing that becomes wet should be immediately removed due to its flammability hazard.

SECTION 9: Physical and chemical properties

Appearance (physical state, color):	Clear, colorless liquid	**Explosion limit lower**: **Explosion limit upper**:	0.9% (V) 6.7% (V)
Odor:	Sweet Aromatic	**Vapor pressure at 20°C**:	8 mbar @20C
Odor threshold:	0.05 ppm	**Vapor density**:	3.67
pH-value:	Not Determined	**Relative density**:	0.86 g/mL at 25 °C (77 °F)
Melting/Freezing point:	-34C	**Solubilities**:	Soluble in most organic solvents.
Boiling point/Boiling range:	137 - 140 °C (279 - 284 °F)	**Partition coefficient (n-octanol/water)**:	log Kow 3.12
Flash point (closed cup):	25 °C (77 °F)	**Auto/Self-ignition temperature**:	460C
Evaporation rate:	Not determined	**Decomposition temperature**:	Not Determined
Flammability (solid, gaseous):	flammable liquid	**Viscosity**:	a. Kinematic: Not determined b. Dynamic: Not Determined
Density at 20°C:	Not Determined		

SECTION 10: Stability and reactivity

Reactivity:

Nonreactive under normal conditions.

Chemical stability:

Stable under normal conditions.

Possible hazardous reactions:

None under normal processing. Vapours may form explosive mixture with air.

Conditions to avoid:

Incompatible materials. Ignition sources. excess heat. Open Flames. Hot surfaces.

Incompatible materials:

Oxidizing agents. Acids.

Hazardous decomposition products:

Carbon oxides.

SECTION 11: Toxicological information

Acute Toxicity:

Oral:

1330-20-7 (Xylenes) LD50 Rat: 4,300 mg/kg

Dermal:

1330-20-7 (Xylenes) LD50 Rabbit: >1,700 mg/kg

Inhalation:

1330-20-7 (Xylenes) LD50 Rat: 5000 ppm - 4h

Chronic Toxicity: No additional information.
Corrosion Irritation:

Dermal:

1330-20-7 (Xylenes) Rabbit: Skin Irritation - 24 h

Ocular:

1330-20-7 (Xylenes) Rabbit: mild eye irritation

Sensitization: No additional information.
Numerical Measures: No additional information.
Carcinogenicity:

IARC:: Group 3: Not classifiable as to its carcinogenicity to humans (Xylene)
NTP (National Toxicology Program) : Evidence of Carcinogenicity - Male Rat - No Evidence; Female Rat - No Evidence; Male Mice - No Evidence; Female Mice - No Evidence (TR-327, mixed) (Xylenes 1330-20-7)
ACGIH - A4 -: Not Classifiable as a Human Carcinogen Xylene (o-, m-, p- isomers) 1330-20-7

Mutagenicity: No additional information.
Reproductive Toxicity: No additional information.

SECTION 12: Ecological information

Ecotoxicity: No additional information.
Persistence and degradability:

Readily biodegradable.

Bioaccumulative potential:

potential for bioconcentration in aquatic organisms is low.

Mobility in soil: No additional information.
Other adverse effects: No additional information.

SECTION 13: Disposal considerations

Waste disposal recommendations:

Contact a licensed professional waste disposal service to dispose of this material. Dispose of empty containers as unused product. Product or containers must not be disposed together with household garbage. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). 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. Ensure complete and accurate classification. RCRA (40 CFR 261.33 Haz Waste Code): Xylenes, mixed isomers (1330-20-7) waste number U239. Included in waste stream: F039.

SECTION 14: Transport information

US DOT

UN Number:
ADR, ADN, DOT, IMDG, IATA

1307

Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: Xylenes.
Hazard Class: 3
Packing Group: III.
Marine Pollutant (if applicable): No
additional information.
Comments: None

Non Bulk:
RQ (if applicable): None
Proper shipping Name: Xylenes.
Hazard Class: 3
Packing Group: III.
Marine Pollutant (if applicable): No
additional information.
Comments: None

SECTION 15: Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Acute, Fire

SARA Section 313 (Specific toxic chemical listings):

1330-20-7 xylenes, mixed isomers 1.0 % de minimis concentration.

RCRA (hazardous waste code):

1330-20-7 Xylenes - U239.
1330-20-7 xylenes, mixed isomers RCRA waste code U239.

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

1330-20-7 xylenes, mixed isomers 100 lbs.

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females:

None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males:

None of the ingredients are listed.

Chemicals known to cause developmental toxicity:

None of the ingredients are listed.

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 1%):

None of the ingredients are listed.

SECTION 16: Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note. The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases: None

Abbreviations and Acronyms: None

Effective date: 01.31.2015
Last updated: 06.17.2015

SAFETY DATA SHEET

Version 6.15
Revision Date 09/07/2024
Print Date 09/08/2024

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

1.1 Product identifiers

Product name : *tert*-Butyl methyl ether

Product Number : 306975
Brand : Sigma-Aldrich
Index-No. : 603-181-00-X
CAS-No. : 1634-04-4

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 liquids (Category 2), H225
Skin irritation (Category 2), H315

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

H225	Highly flammable liquid and vapor.
H315	Causes skin irritation.

Precautionary Statements

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.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
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	:	MTBE Methyl tert-butyl ether
Formula	:	$C_5H_{12}O$
Molecular weight	:	88.15 g/mol
CAS-No.	:	1634-04-4
EC-No.	:	216-653-1
Index-No.	:	603-181-00-X

Component	Classification	Concentration
tert-butyl methyl ether		
	Flam. Liq. 2; Skin Irrit. 2; H225, H315	<= 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
Show this material safety data sheet to the doctor in attendance.

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: 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

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.

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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 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.

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

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Component	CAS-No.	Value	Control parameters	Basis
tert-butyl methyl ether	1634-04-4	TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
		PEL	40 ppm 144 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

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
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: 0.4 mm
Break through time: 120 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
Recommended Filter type: Filter type AX
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 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.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	characteristic
c)	Odor Threshold	0.053 ppm
d)	pH	No data available
e)	Melting point/freezing point	Melting point: -108.6 °C (-163.5 °F) at 1,013 hPa
f)	Initial boiling point and boiling range	55 - 56 °C 131 - 133 °F - lit.
g)	Flash point	-28 °C (-18 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 8.5 %(V) Lower explosion limit: 1.6 %(V)
k)	Vapor pressure	330 hPa at 25 °C (77 °F) - OECD Test Guideline 104
l)	Vapor density	No data available
m)	Density	0.74 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	0.7420 °C
n)	Water solubility	42 g/l at 20 °C (68 °F) - OECD Test Guideline 105
o)	Partition coefficient: n-octanol/water	log Pow: 1.06 at 20 °C (68 °F) - OECD Test Guideline 107 - Bioaccumulation is not expected.
p)	Autoignition temperature	460 °C (860 °F) at 1013.0 hPa - DIN 51794
q)	Decomposition temperature	Distillable in an undecomposed state at normal pressure.
r)	Viscosity	0.409 mm2/s at 40 °C (104 °F) - OECD Test Guideline 114 - 0.464 mm2/s at 20 °C (68 °F) - OECD Test Guideline 114 -
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Surface tension	72.5 mN/m at 1.07g/l at 21.5 °C (70.7 °F) - Surface tension

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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
Strong acids
halogens
Strong bases

10.4 Conditions to avoid
Heat, flames and sparks.
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 and female - > 2,000 mg/kg
(OECD Test Guideline 401)
Symptoms: Nausea, Vomiting, Pulmonary failure possible after aspiration of vomit., Aspiration may cause pulmonary edema and pneumonitis.
LC50 Inhalation - Rat - male and female - 4 h - 85 mg/l - vapor

(OECD Test Guideline 403)
Symptoms: Possible damages:, mucosal irritations
LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 4 h
(OECD Test Guideline 404)
Remarks: Drying-out effect resulting in rough and chapped skin.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation

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(OECD Test Guideline 405)

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

Germ cell mutagenicity
Test Type: In vitro mammalian cell gene mutation test
Test system: Chinese hamster lung cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: Mutagenicity (mammal cell test): micronucleus.
Test system: mouse lymphoma cells
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 473
Result: negative

Test Type: unscheduled DNA synthesis assay
Species: Mouse
Cell type: Liver cells
Application Route: inhalation (vapor)
Method: OECD Test Guideline 486
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: inhalation (vapor)
Method: US-EPA
Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Species: Rat
Cell type: Bone marrow
Application Route: inhalation (vapor)
Method: US-EPA
Result: negative

Test Type: Transgenic rodent somatic cell gene mutation assay
Species: Rat
Cell type: Bone marrow
Application Route: inhalation (vapor)
Method: OECD Test Guideline 488
Result: negative

Carcinogenicity

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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 - 90 d - NOAEL (No observed adverse effect level) - 3,000 mg/kg
Remarks: Subchronic toxicity

RTECS: KN5250000
Nausea, Vomiting, Dizziness, Central nervous system depression, Aspiration or inhalation may cause chemical pneumonitis., MTBE (methyl-tert-butyl ether) is reported to metabolize to tert-butyl alcohol and formaldehyde by microsomal demethylation, MTBE (methyl-tert-butyl ether) should be considered a "potential human carcinogen" due to an increase in leydig interstitial cell tumors of testes in male rats and an increase in lymphomas, leukemias, and uterine sarcomas in female rats., In another unpublished study MTBE was shown to be carcinogenic due to "increased incidence of a rare type of kidney tumor" in male rats and an "increase in the incidence of hepatocellular adenomas" in female mice.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:

After absorption of large quantities:

somnolence
Dizziness
agitation, spasms
CNS disorders
narcosis
Unconsciousness

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

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SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	semi-static test LC50 - Menidia beryllina - 574 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	flow-through test EC50 - Americamysis bahia (Mysid) - 187 mg/l - 96 h (US-EPA OPPTS 850.1035)
Toxicity to algae	static test IC50 - Pseudokirchneriella subcapitata (green algae) - 491 mg/l - 96 h
Toxicity to bacteria	static test EC10 - Pseudomonas putida - 710 mg/l - 18 h Remarks: (ECHA)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Pimephales promelas (fathead minnow) - 299 mg/l - 31 d Remarks: (ECHA)
	flow-through test NOEC - Pimephales promelas (fathead minnow) - 450 mg/l - 31 d Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	flow-through test NOEC - Daphnia magna (Water flea) - 51 mg/l - 21 d (OPPTS 850.1300)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 0 % - Not readily biodegradable. (OECD Test Guideline 301D)

12.3 Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 28 d at 25 °C(tert-butyl methyl ether) Bioconcentration factor (BCF): 1.5

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: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 2398 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: METHYL tert-BUTYL ETHER

IATA
UN number: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether

SECTION 15: Regulatory information

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
tert-butyl methyl ether	1634-04-4	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 : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

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

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tert-butyl methyl ether	1634-04-4	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

tert-butyl methyl ether 1634-04-4

Pennsylvania Right To Know

tert-butyl methyl ether 1634-04-4

Maine Chemicals of High Concern

tert-butyl methyl ether 1634-04-4

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.

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: 6.15 Revision Date: 09/07/2024 Print Date: 09/08/2024

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

according to Regulation (EC) No. 1907/2006

Version 7.5
Revision Date 04.03.2024
Print Date 05.12.2024
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

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

1.1 Product identifiers

Product name	:	Cumene
Product Number	:	C87657
Brand	:	Aldrich
Index-No.	:	601-024-00-X
REACH No.	:	A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.
CAS-No.	:	98-82-8

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

Identified uses	:	Laboratory chemicals, Manufacture 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

Flammable liquids, (Category 3)	H226: Flammable liquid and vapor.
Carcinogenicity, (Category 1B)	H350: May cause cancer.

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Specific target organ toxicity - single exposure, (Category 3), Respiratory system	H335: May cause respiratory irritation.
Aspiration hazard, (Category 1)	H304: May be fatal if swallowed and enters airways.
Long-term (chronic) aquatic hazard, (Category 2)	H411: Toxic to aquatic life with long lasting effects.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008

Pictogram

Signal Word	Danger
Hazard Statements	
H226	Flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H335	May cause respiratory irritation.
H350	May cause cancer.
H411	Toxic to aquatic life with long lasting effects.
Precautionary Statements	
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233	Keep container tightly closed.
P273	Avoid release to the environment.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P331	Do NOT induce vomiting.
Supplemental Hazard Statements	none

Reduced Labeling (<= 125 ml)

Pictogram

Signal Word	Danger
Hazard Statements	
H350	May cause cancer.
H304	May be fatal if swallowed and enters airways.
Precautionary Statements	
P202	Do not handle until all safety precautions have been read and understood.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P331	Do NOT induce vomiting.

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Supplemental Hazard Statements none

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

Ecological information:
The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.
Toxicological information:
The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.
May form explosive peroxides.

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : Isopropylbenzene

Formula : C_9H_{12}
Molecular weight : 120,19 g/mol
CAS-No. : 98-82-8
EC-No. : 202-704-5
Index-No. : 601-024-00-X

Component		Classification	Concentration
cumene			
CAS-No. EC-No. Index-No.	98-82-8 202-704-5 601-024-00-X	Flam. Liq. 3; Carc. 1B; STOT SE 3; Asp. Tox. 1; Aquatic Chronic 2; H226, H350, H335, H304, 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.

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.

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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

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.
Vapors are heavier than air and may spread along floors.
Forms explosive mixtures with air at elevated temperatures.
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
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.

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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. Keep locked up or in an area accessible only to qualified or authorized persons.

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

8.2 Exposure controls

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 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: 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 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: 0,4 mm
Break through time: 10 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

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.

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)	Physical state	liquid, clear
b)	Color	colorless
c)	Odor	aromatic
d)	Melting point/freezing point	Melting point/range: -96 °C - lit.
e)	Initial boiling point and boiling range	152 - 154 °C - lit.
f)	Flammability (solid, gas)	No data available
g)	Upper/lower flammability or explosive limits	Upper explosion limit: 6,0 %(V) Lower explosion limit: 0,9 %(V)
h)	Flash point	31,0 °C - closed cup

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i)	Autoignition temperature	425,0 °C
j)	Decomposition temperature	No data available
k)	pH	Not applicable
l)	Viscosity	Viscosity, kinematic: No data available Viscosity, dynamic: 0,79 mPa.s at 20 °C
m)	Water solubility	ca.0,05 g/l at 25 °C - slightly soluble
n)	Partition coefficient: n-octanol/water	log Pow: 3,55 at 23 °C - Bioaccumulation is not expected.
o)	Vapor pressure	11 hPa at 20,0 °C
p)	Density	0,864 g/mL at 25 °C - lit.
	Relative density	No data available
q)	Relative vapor density	No data available
r)	Particle characteristics	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Surface tension	27,69 mN/m at 25 °C

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapor/air-mixtures are explosive at intense warming.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heating.

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
Symptoms: gastric pain, Vomiting
Symptoms: mucosal irritations, Cough, Shortness of breath, Headache, Nausea, Vomiting,
Possible damages:, damage of respiratory tract
Dermal: No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
(OECD Test Guideline 404)
Remarks: Drying-out effect resulting in rough and chapped skin.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation - 72 h
(OECD Test Guideline 405)

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

Germ cell mutagenicity
Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative
Test Type: Ames test
Test system: S. typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: unscheduled DNA synthesis assay
Test system: rat hepatocytes
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 482
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Red blood cells (erythrocytes)
Application Route: inhalation (gas)
Method: OECD Test Guideline 474
Result: negative

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Test Type: Micronucleus test
Species: Rat
Cell type: Bone marrow
Application Route: Intraperitoneal
Method: OECD Test Guideline 474
Result: Positive results were obtained in some in vivo tests.

Carcinogenicity
Presumed to have carcinogenic potential for humans

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
Inhalation - May cause respiratory irritation. - Respiratory Tract
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

Endocrine disrupting properties

Product:

Assessment	The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

RTECS: GR8575000
narcosis, Central nervous system depression, Dermatitis, Gastrointestinal disturbance, Damage to the lungs., 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.

After uptake of large quantities:

somnolence
Dizziness
narcosis

Effect potentiated by: ethanol

Handle in accordance with good industrial hygiene and safety practice.

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SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Cyprinodon variegatus (sheepshead minnow) - 4,7 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 2,14 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Desmodesmus subspicatus (green algae) - 2,01 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - > 2.000 mg/l - 3 h (OECD Test Guideline 209)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test NOEC - Daphnia magna (Water flea) - 0,35 mg/l - 21 d (OECD Test Guideline 211)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 20 d Result: 70 % - Readily biodegradable. Remarks: (ECHA)

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Endocrine disrupting properties

Product:

Assessment	:	The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

12.7 Other adverse effects

Discharge into the environment must be avoided.

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SECTION 13: Disposal considerations

13.1 Waste treatment methods
No data available

SECTION 14: Transport information

14.1 UN number
ADR/RID: 1918 IMDG: 1918 IATA: 1918

14.2 UN proper shipping name
ADR/RID: ISOPROPYLBENZENE
IMDG: ISOPROPYLBENZENE
IATA: Isopropylbenzene

14.3 Transport hazard class(es)
ADR/RID: 3 IMDG: 3 IATA: 3

14.4 Packaging group
ADR/RID: III IMDG: III IATA: III

14.5 Environmental hazards
ADR/RID: yes IMDG Marine pollutant: yes IATA: no

14.6 Special precautions for user
Tunnel restriction code : (D/E)

Further information : No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

Authorisations and/or restrictions on use

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles (Annex XVII) : cumene

National legislation

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.

E2	ENVIRONMENTAL HAZARDS
P5c	FLAMMABLE LIQUIDS

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Other regulations
Observe work restrictions regarding maternity protection in accordance to Dir 92/85/EEC or stricter national regulations where applicable.

Take note of Dir 94/33/EC on the protection of young people at work.

15.2 Chemical Safety Assessment
For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-Statements

H226	Flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H335	May cause respiratory irritation.
H350	May cause cancer.
H411	Toxic to aquatic life with long lasting effects.

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Full text of other abbreviations

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

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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SAFETY DATA SHEET

Version 6.12
Revision Date 09/07/2024
Print Date 09/08/2024

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

1.1 Product identifiers

Product name : Naphthalene

Product Number : 147141
Brand : Aldrich
Index-No. : 601-052-00-2
CAS-No. : 91-20-3

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 2), H228
Carcinogenicity (Category 2), H351
Short-term (acute) aquatic hazard (Category 1), H400

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operates as MilliporeSigma in the US and Canada

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

Signal Word Warning

Hazard Statements

H228	Flammable solid.
H351	Suspected of causing cancer.
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.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
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	:	C10H8
Molecular weight	:	128.17 g/mol
CAS-No.	:	91-20-3
EC-No.	:	202-049-5
Index-No.	:	601-052-00-2

Component	Classification	Concentration
Naphthalene		
	Flam. Sol. 2; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H228, H351, H400, H410	<= 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

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
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
Combustible.
Vapors are heavier than air and may spread along floors.
Forms explosive mixtures with air on intense heating.
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
Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

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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. 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 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.

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
Tightly closed. Keep away from heat and sources of ignition.

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
Naphthalene	91-20-3	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	10 ppm 50 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	15 ppm 75 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	10 ppm 50 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	0.1 ppm 0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Naphthalene	91-20-3	1-Naphthol + 2-Naphthol			ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

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

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

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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

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
Recommended Filter type: Filter A-(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. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: flakes, granules Color: white
b)	Odor	aromatic
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/ range: 80 - 82 °C (176 - 180 °F) - lit.
f)	Initial boiling point and boiling range	218 °C 424 °F - lit.
g)	Flash point	78.5 °C (173.3 °F) - closed cup - ISO 2719
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	The substance or mixture is a flammable solid with the category 2. - Flammability (solids)
j)	Upper/lower flammability or	Upper explosion limit: 5.9 %(V) Lower explosion limit: 0.9 %(V)

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	explosive limits	
k)	Vapor pressure	0.072 hPa at 20 °C (68 °F) - OECD Test Guideline 104
l)	Vapor density	No data available
m)	Density	1.08 g/cm3 at 24.7 °C (76.5 °F) - OECD Test Guideline 109
	Relative density	No data available
n)	Water solubility	0.0308 g/l at 25 °C (77 °F) - OECD Test Guideline 105 - slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 3.4 at 25 °C (77 °F) - OECD Test Guideline 107 - Bioaccumulation is not expected.
p)	Autoignition temperature	526 - 587 °C (979 - 1089 °F) at 1,013 hPa - DIN 51794
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

Surface tension	31.8 mN/m at 100.0 °C (212.0 °F)

SECTION 10: Stability and reactivity

10.1 Reactivity

Forms explosive mixtures with air on intense heating.
A range from approx. 15 Kelvin below the flash point is to be rated as critical.
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
chromium(VI) oxide
benzoyl chloride
aluminium chloride
Risk of explosion with:
nitrogen oxides

10.4 Conditions to avoid

Heat, flames and sparks.
Strong heating.

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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
LC50 Inhalation - Rat - male and female - 4 h - > 0.4 mg/l - vapor

(OECD Test Guideline 403)
LD50 Dermal - Rabbit - 20,000 mg/kg
Remarks: (RTECS)

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 24 h
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation - 24 h
Remarks: (ECHA)

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

Germ cell mutagenicity
Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: Chinese hamster ovary cells
Metabolic activation: Metabolic activation
Method: OECD Test Guideline 473
Result: positive
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Test Type: unscheduled DNA synthesis assay
Species: Rat
Cell type: Liver cells
Application Route: Oral
Method: OECD Test Guideline 486
Result: negative

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Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: Intraperitoneal
Method: US-EPA
Result: negative
Remarks: (ECHA)

Carcinogenicity
Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Naphthalene)

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. (Naphthalene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Naphthalene)

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. (Naphthalene)

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 - 91 Days - NOAEL (No observed adverse effect level) - 200 mg/kg - LOAEL (Lowest observed adverse effect level) - 400 mg/kg

Repeated dose toxicity - Mouse - male and female - Oral - 90 Days - NOAEL (No observed adverse effect level) - 100 mg/kg

Repeated dose toxicity - Rat - male and female - Dermal - 90 Days - NOAEL (No observed adverse effect level) - 1,000 mg/kg

Repeated dose toxicity - Rat - male and female - inhalation (vapor) - 90 Days - NOAEL (No observed adverse effect level) - 300 mg/kg

RTECS: QJ0525000
Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer., Naphthalene is retinotoxic and systemic absorption of its vapors above 15ppm, may result in:, cataracts,

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optic neuritis, corneal injury, Eye irritation, Ingestion may provoke the following symptoms:, hemolytic anemia, hemoglobinuria, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Convulsions, anemia, Kidney injury may occur., Seizures., Coma.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

Headache
Stomach/intestinal disorders
Tremors
Convulsions
Changes in the blood count

Other dangerous properties can not be excluded.

This substance should be handled with particular care.

Heart -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 1.6 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 2.16 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test EC50 - Pseudokirchneriella subcapitata (green algae) - 2.96 mg/l - 4 h (US-EPA) Remarks: (ECHA)
Toxicity to fish(Chronic toxicity)	flow-through test LC50 - Oncorhynchus kisutch (coho salmon) - 2.1 mg/l - 96 h Remarks: (ECHA)
	flow-through test NOEC - Oncorhynchus kisutch (coho salmon) - 0.37 mg/l - 40 Days Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	static test NOEC - Daphnia pulex (Water flea) - 0.59 mg/l - 125 d Remarks: (ECHA)

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12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d
Result: 2 % - Not readily biodegradable.
(OECD Test Guideline 302C)

12.3 Bioaccumulative potential

Bioaccumulation Cyprinus carpio (Carp) - 56 d
at 25 °C(Naphthalene)

Bioconcentration factor (BCF): 36.5 - 168
(OECD Test Guideline 305)

Remarks: Bioaccumulation is unlikely.

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: 1334 Class: 4.1 Packing group: III
Proper shipping name: Naphthalene, refined
Reportable Quantity (RQ): 100 lbs
Marine pollutant: yes Poison Inhalation Hazard: No

IMDG

UN number: 1334 Class: 4.1 Packing group: III EMS-No: F-A, S-G
Proper shipping name: NAPHTHALENE, REFINED

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Marine pollutant : yes

IATA
UN number: 1334 Class: 4.1 Packing group: III
Proper shipping name: Naphthalene, refined

SECTION 15: Regulatory information

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Naphthalene	91-20-3	100	100

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 : Fire Hazard
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

Naphthalene 91-20-3

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

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

1.1 Product identifier

Identification of the substance	**1,2,4-Trimethylbenzene**
Article number	4913
Registration number (REACH)	This information is not available.
Index No	601-043-00-3
EC number	202-436-9
CAS number	95-63-6

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

Identified uses: laboratory chemical

1.3 Details of the supplier of the safety data sheet

Carl Roth GmbH + Co KG
Schoemperlenstr. 3-5
D-76185 Karlsruhe
Germany

Telephone: +49 (0) 721 - 56 06 0
Telefax: +49 (0) 721 - 56 06 149
e-mail: sicherheit@carlroth.de
Website: www.carlroth.de

Competent person responsible for the safety data sheet : Department Health, Safety and Environment

e-mail (competent person) **: sicherheit@carlroth.de**

1.4 Emergency telephone number

Emergency information service **Poison Centre Munich: +49/(0)89 19240**

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 (CLP)

Classification acc. to GHS

Section	Hazard class	Hazard class and category	Hazard statement
2.6	flammable liquid	(Flam. Liq. 3)	H226
3.1I	acute toxicity (inhal.)	(Acute Tox. 4)	H332
3.2	skin corrosion/irritation	(Skin Irrit. 2)	H315
3.3	serious eye damage/eye irritation	(Eye Irrit. 2)	H319
3.8R	specific target organ toxicity - single exposure (respiratory tract irritation)	(STOT SE 3)	H335
4.1C	hazardous to the aquatic environment - chronic hazard	(Aquatic Chronic 2)	H411

Remarks
For full text of Hazard- and EU Hazard-statements: see SECTION 16.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008 (CLP)

Signal word **Warning**

Pictograms

Hazard statements

H226	Flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statements

Precautionary statements - prevention

P210	Keep away from heat, hot surfaces, sparks, open flames. No smoking.
P273	Avoid release to the environment.
P280	Wear protective gloves/eye protection.

Precautionary statements - response

P303+P361+P353	IF ON SKIN (or hair): take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Labelling of packages where the contents do not exceed 125 ml
Signal word: **Warning**
Symbol(s)

2.3 Other hazards

There is no additional information.

SECTION 3: Composition/information on ingredients

3.1 Substances

Name of substance	1,2,4-Trimethylbenzene
Index No	601-043-00-3
EC number	202-436-9
CAS number	95-63-6
Molecular formula	C_9H_{12}
Molar mass	120,2 $^{g}/_{mol}$

SECTION 4: First aid measures

4.1 Description of first aid measures

General notes

Take off contaminated clothing.

Following inhalation

Provide fresh air. In all cases of doubt, or when symptoms persist, seek medical advice.

Following skin contact

Rinse skin with water/shower. In case of skin irritation, consult a physician.

Following eye contact

Irrigate copiously with clean, fresh water for at least 10 minutes, holding the eyelids apart. In case of eye irritation consult an ophthalmologist.

Following ingestion

Rinse mouth. Call a doctor if you feel unwell.

4.2 Most important symptoms and effects, both acute and delayed

Unconsciousness, Agitation, Headache, Seizures, Cough, Vertigo, Nausea, Irritation, Vomiting

4.3 Indication of any immediate medical attention and special treatment needed

Give sodium sulfate as laxative (1 tablespoon in 1 glass of water) with plenty of activated coal.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Co-ordinate fire-fighting measures to the fire surroundings
foam, dry extinguishing powder, carbon dioxide (CO2)

Unsuitable extinguishing media

water jet

5.2 Special hazards arising from the substance or mixture

Combustible. Vapours are heavier than air, spread along floors and form explosive mixtures with air. Vapours can form explosive mixtures with air.

Hazardous combustion products

In case of fire may be liberated: carbon monoxide (CO), carbon dioxide (CO2)

5.3 Advice for firefighters

Do not allow firefighting water to enter drains or water courses. Fight fire with normal precautions from a reasonable distance. Wear self-contained breathing apparatus.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Wearing of suitable protective equipment (including personal protective equipment referred to under Section 8 of the safety data sheet) to prevent any contamination of skin, eyes and personal clothing. Avoid contact with skin, eyes and clothes. Do not breathe vapour/spray. Avoidance of ignition sources.

6.2 Environmental precautions

Keep away from drains, surface and ground water. Retain contaminated washing water and dispose it. Explosive properties.

6.3 Methods and material for containment and cleaning up

Advices on how to contain a spill

Covering of drains.

Advices on how to clean up a spill

Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents).

Other information relating to spills and releases

Place in appropriate containers for disposal. Ventilate affected area.

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

Provision of sufficient ventilation.

• Measures to prevent fire as well as aerosol and dust generation

Keep away from sources of ignition - No smoking.

Take precautionary measures against static discharge.

Advice on general occupational hygiene

Wash hands before breaks and after work. Keep away from food, drink and animal feedingstuffs. When using do not smoke.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a cool place.

Incompatible substances or mixtures

Observe hints for combined storage.

Consideration of other advice

Ground/bond container and receiving equipment.

• Ventilation requirements

Use local and general ventilation.

• Specific designs for storage rooms or vessels

Recommended storage temperature: 4 °C.

7.3 Specific end use(s)

No information available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

National limit values

Occupational exposure limit values (Workplace Exposure Limits)

Country	Name of agent	CAS No	Notation	Identifier	TWA [ppm]	TWA [mg/m³]	STEL [ppm]	STEL [mg/m³]	Source
EU	1,2,4-trimethylbenzene	95-63-6		IOELV	20	100			2000/39/EC
MT	1,2,4-trimethylbenzene	95-63-6		OELV	20	100			L.N. 227

Notation

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

8.2 Exposure controls

Individual protection measures (personal protective equipment)

Eye/face protection

Use safety goggle with side protection.

Skin protection

• hand protection

Wear suitable gloves. Chemical protection gloves are suitable, which are tested according to EN 374. 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.

• type of material

FKM: fluoro-elastomer

• material thickness

0,7mm.

• breakthrough times of the glove material

>480 minutes (permeation: level 6)

Splash protection - Protective gloves

• Type of material

NBR (Nitrile rubber).

• Material thickness

0,4 mm.

• Breakthrough times of the glove material

>30 minutes (permeation: level 2).

• other protection measures

Take recovery periods for skin regeneration. Preventive skin protection (barrier creams/ointments) is recommended.

Respiratory protection

Respiratory protection necessary at: Aerosol or mist formation. Type: A (against organic gases and vapours with a boiling point of > 65 °C , colour code: Brown).
Observe the wear time limits according GefStoffV in combination with the rules for using respiratory protection apparatus (BGR 190).

Environmental exposure controls

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 (fluid)
Colour	colourless
Odour	characteristic
Odour threshold	No data available

Other physical and chemical parameters

pH (value)	This information is not available.
Melting point/freezing point	-43,77 °C
Initial boiling point and boiling range	169,4 °C at 101,3 kPa
Flash point	44 °C at 101,3 kPa
Evaporation rate	no data available
Flammability (solid, gas)	not relevant (fluid)
Explosive limits	
• lower explosion limit (LEL)	0,8 vol% (42 g/m³)
• upper explosion limit (UEL)	7 vol% (350 g/m³)
Explosion limits of dust clouds	not relevant
Vapour pressure	0,3 kPa at 25 °C
Density	0,88 $^{g}/_{cm^3}$ at 20 °C
Vapour density	4,15 air = 1
Bulk density	Not applicable
Relative density	Information on this property is not available.
Solubility(ies)	
Water solubility	57 $^{mg}/_{l}$ at 25 °C
Partition coefficient	
n-octanol/water (log KOW)	3,7
Soil organic carbon/water (log KOC)	3,041 (ECHA)
Auto-ignition temperature	500 °C - ECHA
Decomposition temperature	no data available
Viscosity	
• dynamic viscosity	0,727 mPa s at 20 °C
Explosive properties	none
Oxidising properties	none

9.2 Other information

There is no additional information.

SECTION 10: Stability and reactivity

10.1 Reactivity

risk of ignition. In case of warming:. Vapours can form explosive mixtures with air.

10.2 Chemical stability

The material is stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

10.3 Possibility of hazardous reactions

Violent reaction with: Nitric acid, Strong oxidiser

10.4 Conditions to avoid

Keep away from heat.

10.5 Incompatible materials

There is no additional information.

10.6 Hazardous decomposition products

Hazardous combustion products: see section 5.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Exposure route	Endpoint	Value	Species	Source
oral	LD50	6.000 $^{mg}/_{kg}$	rat	ECHA

Skin corrosion/irritation

Causes skin irritation.

Serious eye damage/eye irritation

Causes serious eye irritation.

Respiratory or skin sensitisation

Shall not be classified as a respiratory or skin sensitiser.

Summary of evaluation of the CMR properties

Shall not be classified as germ cell mutagenic, carcinogenic nor as a reproductive toxicant

• Specific target organ toxicity - single exposure

May cause respiratory irritation.

• Specific target organ toxicity - repeated exposure

Shall not be classified as a specific target organ toxicant (repeated exposure).

Aspiration hazard

Shall not be classified as presenting an aspiration hazard.

Symptoms related to the physical, chemical and toxicological characteristics

• If swallowed

vomiting, pneumonia

• If in eyes
data are not available

• If inhaled
vertigo, cough, Dyspnoea

• If on skin
causes skin irritation

Other information
Headache, Spasms, Unconsciousness, Vertigo

SECTION 12: Ecological information

12.1 Toxicity

Toxic to aquatic life with long lasting effects.

Aquatic toxicity (acute)

Endpoint	Value	Species	Source	Exposure time
LC50	7,72 $^{mg}/_{l}$	fish	ECHA	96 hours
EC50	2,356 $^{mg}/_{l}$	algae	ECHA	96 hours

Aquatic toxicity (chronic)
May cause long-term adverse effects in the aquatic environment.

12.2 Process of degradability

Theoretical Oxygen Demand: 3,195 $^{mg}/_{mg}$
Theoretical Carbon Dioxide: 3,295 $^{mg}/_{mg}$

12.3 Bioaccumulative potential

Does not significantly accumulate in organisms.

n-octanol/water (log KOW)	3,7
BCF	243 (ECHA)

12.4 Mobility in soil

The Organic Carbon normalised adsorption coefficient	3,041

12.5 Results of PBT and vPvB assessment

Data are not available.

12.6 Other adverse effects

Hazardous to water.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

This material and its container must be disposed of as hazardous waste. Dispose of contents/container in accordance with local/regional/national/international regulations.

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.

13.2 Relevant provisions relating to waste

The allocation of waste identity numbers/waste descriptions must be carried out according to the EEC, specific to the industry and process.

13.3 Remarks

Waste shall be separated into the categories that can be handled separately by the local or national waste management facilities. Please consider the relevant national or regional provisions.

SECTION 14: Transport information

14.1	UN number	**3295**
14.2	UN proper shipping name	**HYDROCARBONS, LIQUID, N.O.S.**
	Hazardous ingredients	1,2,4-Trimethylbenzene
14.3	Transport hazard class(es)	
	Class	3 (flammable liquids)
14.4	Packing group	III (substance presenting low 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.

14.8 Information for each of the UN Model Regulations

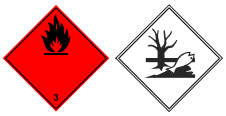
• Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN)

UN number	3295
Proper shipping name	HYDROCARBONS, LIQUID, N.O.S.
Particulars in the transport document	UN3295, HYDROCARBONS, LIQUID, N.O.S., 3, III, (D/E), environmentally hazardous
Class	3
Classification code	F1
Packing group	III
Danger label(s)	3 + "fish and tree"

Environmental hazards	yes (hazardous to the aquatic environment)
Excepted quantities (EQ)	E1
Limited quantities (LQ)	5 L
Transport category (TC)	3
Tunnel restriction code (TRC)	D/E
Hazard identification No	30

• International Maritime Dangerous Goods Code (IMDG)

UN number	3295
Proper shipping name	HYDROCARBONS, LIQUID, N.O.S.
Particulars in the shipper's declaration	UN3295, HYDROCARBONS, LIQUID, N.O.S., 3, III, 44°C c.c., MARINE POLLUTANT
Class	3
Marine pollutant	yes (hazardous to the aquatic environment)
Packing group	III
Danger label(s)	3 + "fish and tree"



Special provisions (SP)	223
Excepted quantities (EQ)	E1
Limited quantities (LQ)	5 L
EmS	F-E, S-D
Stowage category	A

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)

• Regulation 649/2012/EU concerning the export and import of hazardous chemicals (PIC)
Not listed.

• Regulation 1005/2009/EC on substances that deplete the ozone layer (ODS)
Not listed.

• Regulation 850/2004/EC on persistent organic pollutants (POP)
Not listed.

• Restrictions according to REACH, Annex XVII
not listed

• List of substances subject to authorisation (REACH, Annex XIV)
not listed

• Seveso Directive

2012/18/EU (Seveso III)				
No	**Dangerous substance/hazard categories**	**Qualifying quantity (tonnes) for the application of lower and upper-tier requirements**		**Notes**
P5c	flammable liquids (cat. 2, 3)	5.000	50.000	51)
E2	environmental hazards (hazardous to the aquatic environment, cat. 2)	200	500	57)

Notation
51) Flammable liquids, categories 2 or 3 not covered by P5a and P5b
57) Hazardous to the Aquatic Environment in category Chronic 2

• Limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products (2004/42/EC, Deco-Paint Directive)

VOC content 100 %

• Directive on industrial emissions (VOCs, 2010/75/EU)

VOC content 100 %

Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) - Annex II
not listed

Regulation 166/2006/EC concerning the establishment of a European Pollutant Release and Transfer Register (PRTR)
not listed

Directive 2000/60/EC establishing a framework for Community action in the field of water policy (WFD)
not listed

National inventories
Substance is listed in the following national inventories:

- EINECS/ELINCS/NLP (Europe)
- REACH (Europe)

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	Comission 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)
CLP	Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
CMR	Carcinogenic, Mutagenic or toxic for Reproduction
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
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
L.N. 227	Occupational Health and Safety Authority Act (CAP. 424)
MARPOL	International Convention for the Prevention of Pollution from Ships (abbr. of "Marine Pollutant)
NLP	No-Longer Polymer
PBT	Persistent, Bioaccumulative and Toxic
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

Key literature references and sources for data

- Regulation (EC) No. 1907/2006 (REACH), amended by 2015/830/EU
- Regulation (EC) No. 1272/2008 (CLP, EU GHS)

List of relevant phrases (code and full text as stated in chapter 2 and 3)

Code	Text
H226	flammable liquid and vapour
H315	causes skin irritation
H319	causes serious eye irritation
H332	harmful if inhaled
H335	may cause respiratory irritation
H411	toxic to aquatic life with long lasting effects

Disclaimer

The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product with other products or in the case of processing, the information on this safety data sheet is not necessarily valid for the new made-up material.

SAFETY DATA SHEET

Creation Date 26-Sep-2009 **Revision Date** 31-Jan-2023 **Revision Number** 7

1. Identification

Product Name **Mesitylene**

Cat No. : **AC161320000; AC161320010; AC161320025; AC161320050; AC161322500**

CAS No 108-67-8
Synonyms 1,3,5-Trimethylbenzene

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
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).	
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

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
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
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
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)
Toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS No	Weight %
1,3,5-Trimethylbenzene	108-67-8	<100

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. Vapors may cause drowsiness and dizziness: Symptoms may be delayed: 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	44 °C / 111.2 °F
Method -	No information available
Autoignition Temperature	550 °C / 1022 °F

Explosion Limits

Upper	6.00%
Lower	1.00%
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	2	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. 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. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. 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. Nitric acid.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
1,3,5-Trimethylbenzene	TWA: 10 ppm		TWA: 25 ppm TWA: 125 mg/m^3	

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
NIOSH: 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. Use explosion-proof electrical/ventilating/lighting equipment.

Personal Protective Equipment

Eye/face Protection Tight sealing safety goggles. Face protection shield.

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.

Recommended Filter type: Organic gases and vapours filter. Type A. Brown. conforming to EN14387.

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	-45 °C / -49 °F
Boiling Point/Range	163 - 166 °C / 325.4 - 330.8 °F @ 760 mmHg
Flash Point	44 °C / 111.2 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.00%
Lower	1.00%

Vapor Pressure	2.5 mbar @ 20 °C
Vapor Density	4.1 (Air = 1.0)
Specific Gravity	0.868
Solubility	Slightly soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	550 °C / 1022 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C9 H12
Molecular Weight	120.19

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, Nitric acid

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
1,3,5-Trimethylbenzene	Not listed	Not listed	LC50 = 24 g/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, 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
1,3,5-Trimethylbenzene	108-67-8	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Not mutagenic in AMES Test

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 None known

Aspiration hazard Category 1

Symptoms / effects,both acute and delayed Vapors may cause drowsiness and dizziness: Symptoms may be 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. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
1,3,5-Trimethylbenzene	Not listed	LC50: = 3.48 mg/L, 96h (Pimephales promelas)	Not listed	Not listed

Persistence and Degradability based on information available. 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 UN2325
Proper Shipping Name 1,3,5-TRIMETHYLBENZENE
Hazard Class 3
Packing Group III

TDG

UN-No UN2325
Proper Shipping Name 1,3,5-TRIMETHYLBENZENE
Hazard Class 3
Packing Group III

IATA

UN-No UN2325
Proper Shipping Name 1,3,5-TRIMETHYLBENZENE
Hazard Class 3
Packing Group III

IMDG/IMO

UN-No UN2325
Proper Shipping Name 1,3,5-TRIMETHYLBENZENE
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
1,3,5-Trimethylbenzene	108-67-8	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT) Not applicable

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
1,3,5-Trimethylbenzene	108-67-8	X	-	203-604-4	X	X	X	X	X	KE-34411

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

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
1,3,5-Trimethylbenzene	X	-	-	-	-

U.S. Department of Transportation
Reportable Quantity (RQ): N
DOT Marine Pollutant Y
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 Not applicable

Component	CAS No	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)
1,3,5-Trimethylbenzene	108-67-8	-	-	-

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)
1,3,5-Trimethylbenzene	108-67-8	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)
1,3,5-Trimethylbenzene	108-67-8	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 31-Jan-2023
Print Date 31-Jan-2023
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

according to Regulation (EC) No. 1907/2006

Version 7.5
Revision Date 18.12.2024
Print Date 16.01.2025
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

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

1.1 Product identifiers

Product name : 1,2-Dichloroethane

Product Number : 284505
Brand : Sigma-Aldrich
Index-No. : 602-012-00-7
REACH No. : 01-2119484658-20-XXXX
CAS-No. : 107-06-2

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

Identified uses : Scientific research and development

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

Flammable liquids, (Category 2)	H225: Highly flammable liquid and vapor.
Acute toxicity, (Category 4)	H302: Harmful if swallowed.
Acute toxicity, (Category 3)	H331: Toxic if inhaled.
Skin irritation, (Category 2)	H315: Causes skin irritation.
Eye irritation, (Category 2)	H319: Causes serious eye irritation.
Carcinogenicity, (Category 1B)	H350: May cause cancer.

The life science business of Merck operates as MilliporeSigma in the US and Canada

Specific target organ toxicity - single exposure, (Category 3), Respiratory system	H335: May cause respiratory irritation.
Aspiration hazard, (Category 1)	H304: May be fatal if swallowed and enters airways.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008

Pictogram

Signal Word	Danger
Hazard Statements	
H225	Highly flammable liquid and vapor.
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.
Precautionary Statements	
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
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.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P331	Do NOT induce vomiting.
Supplemental Hazard Statements	none
	Restricted to professional users.

Reduced Labeling (<= 125 ml)

Pictogram

Signal Word	Danger
Hazard Statements	
H331	Toxic if inhaled.
H350	May cause cancer.
H304	May be fatal if swallowed and enters airways.
Precautionary Statements	
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable

The life science business of Merck operates as MilliporeSigma in the US and Canada

	for breathing. Call a POISON CENTER/ doctor.
P331	Do NOT induce vomiting.
Supplemental Hazard Statements	none

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

Ecological information:
The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.
Toxicological information:
The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Ethylene dichloride Ethylene chloride
Formula	:	$C_2H_4Cl_2$
Molecular weight	:	98,96 g/mol
CAS-No.	:	107-06-2
EC-No.	:	203-458-1
Index-No.	:	602-012-00-7

Component		Classification	Concentration
1,2-Dichloroethane Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)			
CAS-No. EC-No. Index-No.	107-06-2 203-458-1 602-012-00-7	Flam. Liq. 2; Acute Tox. 4; Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2; Carc. 1B; STOT SE 3; Asp. Tox. 1; H225, H302, H331, H315, H319, H350, H335, H304	<= 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. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

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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

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.

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.

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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 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

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. Keep locked up or in an area accessible only to qualified or authorized persons.

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

8.2 Exposure controls

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 EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact

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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 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: Chloroprene
Minimum layer thickness: 0,65 mm
Break through time: 10 min
Material tested:KCL 720 Camapren®

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

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.

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)	Physical state	viscous liquid
b)	Color	colorless
c)	Odor	of solvents
d)	Melting point/freezing point	Melting point/ range: -35 °C - lit.
e)	Initial boiling point and boiling range	83 °C - lit.
f)	Flammability (solid, gas)	No data available
g)	Upper/lower flammability or explosive limits	Upper explosion limit: 15,9 %(V) Lower explosion limit: 6 %(V)
h)	Flash point	ca.13 °C - closed cup - DIN 51755 Part 1
i)	Autoignition temperature	440 °C at 1.013 hPa - DIN 51794
j)	Decomposition temperature	300 °C
k)	pH	No data available

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l)	Viscosity	Viscosity, kinematic: No data available Viscosity, dynamic: 0,83 mPa.s at 20 °C
m)	Water solubility	7,9 g/l at 25 °C - OECD Test Guideline 105- soluble
n)	Partition coefficient: n-octanol/water	log Pow: 1,45 at 20 °C - Bioaccumulation is not expected.
o)	Vapor pressure	87 hPa at 20 °C 102 hPa at 25 °C
p)	Density	1,256 g/mL at 25 °C - lit.
	Relative density	No data available
q)	Relative vapor density	No data available
r)	Particle characteristics	No data available
s)	Explosive properties	Not classified as explosive.
t)	Oxidizing properties	none

9.2 Other safety information

Surface tension	32,45 mN/m at 20 °C
Relative vapor density	4,1 at 20 °C

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

Exothermic reaction with:
Alkaline earth metals
alkali amides
Nitric acid
nitrogen oxides
Oxidizing agents
Chlorine
powdered magnesium
Zinc
Risk of explosion with:
Alkali metals
powdered aluminium
Powdered metals
Potassium
nitrogen dioxide

10.4 Conditions to avoid

Warming.

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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
LD50 Oral - Rat - male - 770 mg/kg
(OECD Test Guideline 401)
Acute toxicity estimate Oral - 770 mg/kg
(ATE value derived from LD50/LC50 value)
LC50 Inhalation - Rat - male and female - 4 h - 7,8 mg/l - vapor

(OECD Test Guideline 403)
Acute toxicity estimate Inhalation - 7,8 mg/l - vapor

(ATE value derived from LD50/LC50 value)
LD50 Dermal - Rabbit - male - 4.890 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation
Skin - Rabbit
Result: irritating
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation
(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: S. typhimurium
Metabolic activation: with and without metabolic activation
Result: positive
Remarks: (ECHA)
Test Type: Ames test
Test system: Escherichia coli
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 471
Result: positive
Test Type: In vitro mammalian cell gene mutation test
Test system: human lymphoblastoid cells
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 476
Result: positive
Test Type: In vitro mammalian cell gene mutation test
Test system: human lymphoblastoid cells

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Metabolic activation: without metabolic activation
Result: positive
Remarks: (ECHA)
Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: Chinese hamster lung cells
Metabolic activation: with and without metabolic activation
Result: positive
Remarks: (ECHA)
Test Type: unscheduled DNA synthesis assay
Test system: rat hepatocytes
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 482
Result: positive

Test Type: Micronucleus test
Species: Mouse

Application Route: Intraperitoneal
Method: OECD Test Guideline 474
Result: negative

Test Type: Mutagenicity (mammal cell test): micronucleus.
Species: Mouse
Cell type: Red blood cells (erythrocytes)
Application Route: Oral
Method: OECD Test Guideline 474
Result: negative

Test Type: sister chromatid exchange assay
Species: Rat
Cell type: mammary gland
Application Route: inhalation (vapor)

Result: negative
Remarks: (ECHA)

Species: Drosophila melanogaster
Cell type: sperm
Application Route: Inhalation
Method: OECD Test Guideline 477
Result: positive

Test Type: Transgenic rodent somatic cell gene mutation assay
Species: Mouse

Application Route: Intraperitoneal

Result: negative
Remarks: (ECHA)

Carcinogenicity
Presumed to have carcinogenic potential for humans

Reproductive toxicity
No data available

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Specific target organ toxicity - single exposure
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

Endocrine disrupting properties

Product:

Assessment	The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Repeated dose toxicity - Rat - male and female - Oral - 90 d - NOAEL (No observed adverse effect level) - 37,5 mg/kg
Remarks: Subchronic toxicity

Repeated dose toxicity - Mouse - male and female - Inhalation - 104 Weeks

RTECS: KI0525000
Acts as a simple asphyxiant by displacing air., anesthetic effects, Difficulty in breathing, Headache, Dizziness, Prolonged or repeated contact with skin may cause:, defatting, Dermatitis, Contact with eyes can cause:, Redness, Blurred vision, Provokes tears., Effects due to ingestion may include:, Gastrointestinal discomfort, Central nervous system depression, Paresthesia., Drowsiness, Convulsions, Conjunctivitis., Pulmonary edema. Effects may be delayed., Irregular breathing., Stomach/intestinal disorders, Nausea, Vomiting, Increased liver enzymes., Weakness, Heavy or prolonged skin exposure may result in the absorption of harmful amounts of material.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Pancreas. -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 136 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 160 mg/l - 48 h Remarks: (in soft water) (IUCLID)
Toxicity to algae	static test EC50 - Desmodesmus subspicatus (green algae) - 166 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - 35.500 mg/l - 3 h

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(OECD Test Guideline 209)

Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	static test NOEC - Daphnia magna (Water flea) - 11 mg/l - 28 d Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 20 d Result: > 90 % - Inherently biodegradable. Remarks: (ECHA)

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus - 14 d at 16 °C - 0,957 mg/l(1,2-Dichloroethane) Bioconcentration factor (BCF): 2

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Endocrine disrupting properties

Product:

Assessment	:	The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

No data available

SECTION 14: Transport information

14.1 UN number

ADR/RID: 1184 IMDG: 1184 IATA: 1184

14.2 UN proper shipping name

ADR/RID: ETHYLENE DICHLORIDE
IMDG: ETHYLENE DICHLORIDE
IATA: Ethylene dichloride

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14.3 Transport hazard class(es)

ADR/RID: 3 (6.1) IMDG: 3 (6.1) IATA: 3 (6.1)

14.4 Packaging group

ADR/RID: II IMDG: II IATA: II

14.5 Environmental hazards

ADR/RID: no IMDG Marine pollutant: no IATA: no

14.6 Special precautions for user

Tunnel restriction code : (D/E)

Further information : No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

Authorisations and/or restrictions on use

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles (Annex XVII) : 1,2-Dichloroethane

REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59). : 1,2-Dichloroethane

This product contains a substance listed on Annex XIV of the REACH Regulation (EC) Nr. 1907/2006.

Listed substance / Sunset Date : 1,2-Dichloroethane / 22.11.2017

After the sunset date the use of this substance requires either an authorization or can only be used for exempted uses, e.g. use in scientific research and development which includes routine analytics or use as intermediate.

National legislation

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.	H2	ACUTE TOXIC
	P5c	FLAMMABLE LIQUIDS
	H2	ACUTE TOXIC
	P5c	FLAMMABLE LIQUIDS

Other regulations

Observe work restrictions regarding maternity protection in accordance to Dir 92/85/EEC or stricter national regulations where applicable.

Take note of Dir 94/33/EC on the protection of young people at work.

15.2 Chemical Safety Assessment

For this product a chemical safety assessment was not carried out

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SECTION 16: Other information

Full text of H-Statements

H225	Highly flammable liquid and vapor.
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.

Full text of other abbreviations

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

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

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SAFETY DATA SHEET

Version 6.10
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 : 1,2-Dibromoethane

Product Number : D40752
Brand : Aldrich
Index-No. : 602-010-00-6
CAS-No. : 106-93-4

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)

Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Skin irritation (Category 2), H315

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Eye irritation (Category 2A), H319
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
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.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal Word — Danger

Hazard Statements

H311 + H331	Toxic in contact with skin or if inhaled.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H350	May cause cancer.
H411	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.
P261	Avoid breathing mist or vapors.
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.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water.Call a POISON CENTER/ doctor if you feel unwell.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
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

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SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : EDB
Ethylene dibromide

Formula : $C_2H_4Br_2$
Molecular weight : 187.86 g/mol
CAS-No. : 106-93-4
EC-No. : 203-444-5
Index-No. : 602-010-00-6

Component	Classification	Concentration
1,2-dibromoethane		
	Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Carc. 1B; STOT SE 3; Aquatic Acute 2; Aquatic Chronic 2; H331, H311, H315, H319, H350, H335, 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
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

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

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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 bromide gas
Combustible.
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: Do not breathe vapors, aerosols. 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 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.

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operates as MilliporeSigma in the US and Canada

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 in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Light sensitive. May darken on storage

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

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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
	Remarks	Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
1,2-dibromoethane	106-93-4	TWA	20 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.31-1970		
		CEIL	30 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.31-1970		
		Peak	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.31-1970		
		See Table Z-2		
		TWA	0.045 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A 15 minute ceiling value		
		C	0.13 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A 15 minute ceiling value		

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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

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: 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 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: 0.4 mm
Break through time: 10 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection

protective clothing

Respiratory protection

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds
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 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.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	sweet
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 8 - 11 °C (46 - 52 °F) - lit.
f)	Initial boiling point and boiling range	131 - 132 °C 268 - 270 °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)	Vapor pressure	72 hPa at 55.0 °C (131.0 °F)
l)	Vapor density	No data available
m)	Density	2.18 g/mL 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

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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
Violent reactions possible with:
Alkali metals
Aluminum
strong alkalis
Light metals
magnesium
alkali amides
Strong oxidizing agents
metals
Ammonia
liquid

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Strong oxidizing agents

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
Acute toxicity estimate Inhalation - 4 h - 3.1 mg/l - vapor

(Expert judgment)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
LD50 Dermal - Rabbit - 300 mg/kg
Remarks: Nutritional and Gross Metabolic:Changes in:Body temperature decrease.
Extremely corrosive and destructive to tissue.
(RTECS)
No data available

Skin corrosion/irritation
Remarks: Causes skin irritation.
Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Irritating to eyes.

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(OECD Test Guideline 405)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: Not a skin sensitizer.
(OECD Test Guideline 429)

Germ cell mutagenicity
In vivo tests did not show mutagenic effects
Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: positive
Test Type: unscheduled DNA synthesis assay
Test system: rat hepatocytes
Method: OECD Test Guideline 482
Result: positive
Test Type: gene mutation test
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: positive
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 473
Result: positive

Species: Mouse

Application Route: Intraperitoneal
Method: OECD Test Guideline 478
Result: negative

Carcinogenicity
This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.
Possible human carcinogen

IARC:	2A - Group 2A: Probably carcinogenic to humans (1,2-dibromoethane)
NTP:	RAHC - Reasonably anticipated to be a human carcinogen (1,2-dibromoethane)
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
Inhalation - May cause respiratory irritation. - Respiratory Tract
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

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Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: KH9275000
Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting., Gastrointestinal disturbance, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Eyes -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	static test LC50 - Oncorhynchus mykiss (rainbow trout) - 1.13 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 11.61 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata - 25.94 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - > 1,000 mg/l (OECD Test Guideline 209)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Oryzias latipes - 5.81 mg/l - 28 d Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 4.2 % - Not readily biodegradable. (OECD Test Guideline 301D)

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

Discharge into the environment must be avoided.

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: 1605 Class: 6.1I Packing group: I
Proper shipping name: Ethylene dibromide
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: Hazard Zone B

IMDG

UN number: 1605 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: ETHYLENE DIBROMIDE
Marine pollutant : yes

IATA

UN number: 1605 Class: 6.1
Proper shipping name: Ethylene dibromide
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

SECTION 15: Regulatory information

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
1,2-dibromoethane	106-93-4	2007-07-01

SARA 311/312 Hazards

The life science business of Merck KGaA, Darmstadt, Germany
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Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,2-dibromoethane	106-93-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,2-dibromoethane	106-93-4	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.1,2-dibromoethane	106-93-4	2011-09-01

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: 03/02/2024 Print Date: 07/13/2024

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SAFETY DATA SHEET

Creation Date 24-Aug-2009 **Revision Date** 13-Oct-2023 **Revision Number** 8

1. Identification

Product Name **Hydrochloric Acid**

Cat No. : **A466-1; A466-2; A466-2LC; A466-250; A466-500;**

CAS No 7647-01-0
Synonyms Muriatic acid

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)

Corrosive to metals	Category 1
Skin Corrosion/Irritation	Category 1 B
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
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
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Water	7732-18-5	62-65
Hydrochloric acid	7647-01-0	35-38

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.

Ingestion	Do NOT induce vomiting. Call a physician or poison control center immediately.
Most important symptoms and effects	Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
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
Corrosive material. Causes burns by all exposure routes. Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products
Hydrogen chloride gas.
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	0	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Do not get in eyes, on skin, or on clothing.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional Ecological Information.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling	Wear personal protective equipment/face protection. Do not breathe mist/vapors/spray. Do not get in eyes, on skin, or on clothing. 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. Incompatible Materials. Metals. Strong oxidizing agents. Bases. sodium hypochlorite. Amines. Fluorine. Cyanides. Alkaline.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Hydrochloric acid	Ceiling: 2 ppm	Ceiling: 5 ppm Ceiling: 7 mg/m³ (Vacated) Ceiling: 5 ppm (Vacated) Ceiling: 7 mg/m³	IDLH: 50 ppm Ceiling: 5 ppm Ceiling: 7 mg/m³	Ceiling: 2 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures 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.

Recommended Filter type: Particulates filter conforming to EN 143. or. Acid gases filter: Type E, Yellow.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	pungent
Odor Threshold	No information available
pH	< 1
Melting Point/Range	-35 °C / -31 °F
Boiling Point/Range	57 °C / 135 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	125 mbar @ 20 °C
Vapor Density	1.27
Specific Gravity	1.18
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	1.8 mPa.s @ 15°C
Molecular Formula	HCl
Molecular Weight	36.46

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 Metals, Strong oxidizing agents, Bases, sodium hypochlorite, Amines, Fluorine, Cyanides, Alkaline

Hazardous Decomposition Products Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions Contact with metals may evolve flammable hydrogen gas.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Vapor LC50 Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	-	-
Hydrochloric acid	238 - 277 mg/kg (Rat)	> 5010 mg/kg (Rabbit)	1.68 mg/L (Rat) 1 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes burns by all exposure routes

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
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Hydrochloric acid	7647-01-0	Not listed	Not listed	Not listed	Not listed	Not listed

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

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 Product is a corrosive material. Use of gastric lavage or emesis is contraindicated.

delayed Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

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. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Hydrochloric acid	-	282 mg/L LC50 96 h Gambusia affinis mg/L LC50 48 h Leucscus idus	-	56mg/L EC50 72h Daphnia

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its 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	UN1789
Proper Shipping Name	HYDROCHLORIC ACID
Hazard Class	8
Packing Group	II

TDG

UN-No	UN1789
Proper Shipping Name	HYDROCHLORIC ACID
Hazard Class	8
Packing Group	II

IATA

UN-No	UN1789
Proper Shipping Name	Hydrochloric acid
Hazard Class	8
Packing Group	II

IMDG/IMO

UN-No	UN1789
Proper Shipping Name	Hydrochloric acid
Hazard Class	8
Packing Group	II

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Water	7732-18-5	X	ACTIVE	-
Hydrochloric acid	7647-01-0	X	ACTIVE	-

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT) Not applicable

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
Water	7732-18-5	X	-	231-791-2	X	X		X	X	KE-35400
Hydrochloric acid	7647-01-0	X	-	231-595-7	X	X	X	X	X	KE-20189

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 %
Hydrochloric acid	7647-01-0	35-38	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
Hydrochloric acid	X	5000 lb	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Hydrochloric acid	X		-

OSHA - Occupational Safety and Health Administration Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Hydrochloric acid	-	TQ: 5000 lb

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
Hydrochloric acid	5000 lb	5000 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
Water	-	-	X	-	-
Hydrochloric acid	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 contains the following DHS chemicals:
Legend - STQs = Screening Threshold Quantities, APA = A placarded amount

Component	DHS Chemical Facility Anti-Terrorism Standard
Hydrochloric acid	Release STQs - 15000lb (concentration >=37%) Release STQs - 5000lb (anhydrous) Theft STQs - 500lb (anhydrous)

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	CAS No	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)
Water	7732-18-5	-	-	-
Hydrochloric acid	7647-01-0	-	Use restricted. See item 75. (see link for restriction details)	-

REACH links
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)
Water	7732-18-5	Listed	Not applicable	Not applicable	Not applicable
Hydrochloric acid	7647-01-0	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?
Not applicable

Other International Regulations

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)
Water	7732-18-5	Not applicable	Not applicable	Not applicable	Not applicable
Hydrochloric acid	7647-01-0	25 tonne	250 tonne	Not applicable	Annex I - Y34

16. Other information

Prepared By

Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date	24-Aug-2009
Revision Date	13-Oct-2023
Print Date	13-Oct-2023
Revision Summary	SDS sections updated. 2. 3. 11.

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

Issue date March 1, 2015

Reviewed date March 1, 2018

Safety Data Sheet

SDS ID# 3025

Section 1. IDENTIFICATION

1.1. Product identifier

Product form : Mixture

Product name : Isobutylene (0.0001%-0.90%) in Air (Oxygen 20.9% bal. Nitrogen)

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

Product use : Calibration gas/Bumptest gas/Function test gas

1.3. Details of the supplier of the safety data sheet

Intermountain Specialty Gases
520 N. Kings Road
Nampa, ID 83687
Telephone 1-208-466-9425 or Toll free 1-800-552-5003
Fax 1-208-466-9144
www.isgases.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300

Section 2. HAZARDS INDENTIFICATION

2.1. Classification of the substance or mixture

Classification GASES UNDER PRESSURE - Compressed gas

2.2. Label elements

Hazard pictograms

Signal word : WARNING

Hazard statements : H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
: CGA-HG24 - MAY SUPPORT COMBUSTION
: OSHA - PG01 - DO NOT REMOVE THIS PRODUCT LABEL

Precautionary statements

[General] : Read and follow all Safety Data Sheets (SDS's) before use. Read label before use. Keep out

of reach of children. If medical advice is needed, have a product container or label at hand. Use equipment rated for cylinder pressure.

[Prevention] : P202 - Do not handle until all safety precautions have been read and understood
: P271+P403- Use only outdoors or in a well-ventilated area

[Response] : P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing.

[Storage] : CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)

[Disposal] : Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity

No data available

Section 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substance

Not applicable

3.2. Mixture

Name	Product Identifier	%
Nitrogen	(CAS No) 7727-37-9	76.5 - 80.4999
Oxygen	(CAS No) 7782-44-7	19.5 - 23.5
Isobutylene	(CAS No) 115-11-7	0.0001 - 0.9

Section 4. FIRST AID MEASURES

4.1. Description of first aid measures

General : IF exposed or concerned: Get medical advice/attention.

Inhalation : Remove to fresh air and keep at rest in a position comfortable for breathing. If breathing has stopped, give artificial respiration or oxygen by trained personnel. If victim feels unwell, seek medical advice.

Skin contact : Immediately flush with copious amount of water for at least 15 minutes.

Eye contact : Immediately flush with copious amount of water for at least 15 minutes.

Ingestion : Ingestion is not considered a potential route of exposure, refer to the inhalation section.

4.2. Most important symptoms/effects, acute and delayed

Acute

Inhalation : Adverse effects not expected from this product.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion	: Ingestion is not considered a potential route of exposure, refer to the inhalation section.
Frostbite	: Thaw frosted parts with lukewarm water. Do not rub affected areas. Get immediate medical advice/attention.
Symptoms/injuries upon intravenous administration	: Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing.
Chronic symptoms	: Adverse effects not expected from this product.
Delayed	: Adverse effects not expected from this product.

4.3. Indication of any immediate medical attention and special treatment needed

If victim feels unwell, seek medical advice. If breathing is difficult, give artificial respiration or oxygen by trained personnel.

Section 5. FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media	: Use extinguishing media appropriate for surrounding fire.
Unsuitable extinguishing media	: None known

5.2. Special hazards arising from the substance or mixture

Fire hazard	: The product is not flammable
Explosion hazard	: Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.
Reactivity	: None known.

5.3. Advice for fire-fighters

Firefighting instructions	: In case of fire: Evacuate all personnel from the danger area. Stop the leak and flow of gas before extinguishing fire, if safe to do so. If this is not possible, withdraw from area and allow fire to burn. Fight fire remotely due to the risk of explosion. Use water spray or fog for cooling exposed containers. Let the fire burn. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Exercise caution when fighting any chemical fire.
Protection during firefighting	: Standard protective clothing and equipment (e.g., Self Contained Breathing Apparatus, SCBA) for fire fighters. Do not enter fire area without proper protective equipment, including respiratory protection.

Section 6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

General measures	: Ensure adequate ventilation.

6.1.1. For non -emergency personnel

Protective equipment	: Wear protective equipment consistent with the site emergency plan.
Emergency procedures	: Escape the danger area by the closest safe route. Close doors and windows of adjacent premises. Keep containers closed. Mark the danger area. Seal off low-lying areas. Keep upwind.

6.1.12. For emergency responders

Protective equipment	: Standard protective clothing and equipment (e.g., Self Contained Breathing Apparatus) for fire fighters. Equip cleanup crew with proper protection.

Emergency procedures	: Evacuate and limit access. Ventilate area. See information above "For non-emergency personnel".

6.2. Methods and material for containment and cleaning up

For containment	: Immediately contact emergency personnel. Try to stop gas leak if safe to do so.
Methods for cleaning up	:Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Precautions for safety handling	: Pressurized container: Do not pierce or burn, even after use. Use equipment rated for cylinder pressure. Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Protect cylinders from physical damage; do not drag, roll, slide, or drop.
Hygiene measures	: Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	: None known.
Storage conditions	: Do not expose to temperatures exceeding 52°C (125°F). Store locked up. Keep containers closed when not in use. Protect cylinder from physical damage. Store and use away from heat, sparks, open flame or any other ignition source. Store in well ventilated area.
Incompatible products	: None known.
Incompatible materials	: None known.

Section 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Nitrogen (7727-37-9)

OSHA PEL		Cal/OSHA PEL	NIOSH REL	ACGIH 2015 TLV
		(as of 4/26/13)	(as of 4/26/13)	
ppm	mg/m^3	8-hour TWA (ST) STEL (C) Ceiling	up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Not established	*Not established*	*Not established*	*Not established*	Simple asphyxiant

Oxygen (7782-44-7)

OSHA PEL		Cal/OSHA PEL	NIOSH REL	ACGIH 2015 TLV
		(as of 4/26/13)	(as of 4/26/13)	
ppm	mg/m^3	8-hour TWA (ST) STEL (C) Ceiling	up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling

There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.

Isobutylene (115-11-7)				
OSHA PEL		Cal/OSHA PEL	NIOSH REL	ACGIH 2015 TLV
		(as of 4/26/13)	(as of 4/26/13)	
ppm	mg/m^3	8-hour TWA (ST) STEL (C) Ceiling	up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
				250 ppm

8.2. Appropriate engineering controls

Engineering measures/controls : Provide adequate general and local exhaust ventilation. Systems under pressure should be regularly check for leakages. Ensure exposure is below occupational exposure limits. Oxygen detectors should be used when asphyxiating gases may me released. Consider work permit system e.g. for maintenance activities.

8.3. Individual protection measures

Hand protection : Wear working gloves when handling gas containers. 29CFR 1910.138: Hand Protection.

Eye protection : Wear safety glasses with side shields. 29 CFR 1910.133: Eye and Face Protection.

Skin and body protection : Wear suitable protective clothing, e.g.-Lab coats, coveralls or flame resistant clothing.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary.

Thermal hazard protection : None necessary during normal and routine operations.

Environmental exposure controls : Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

Other information : Wear safety shoes while handling containers. 29 CFR 1910.136: Foot Protection

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Exposure controls

Appearance : Clear, colorless gas.

Physical state : Gas

Color : Colorless

Odor : No data available

Odor threshold : No data available

pH : No data available

Freezing point : No data available

Flash point : -76 °C / -105°F

Evaporation rate : No data available

Flammability (solid, gas) : Not Flammable - not combustible

Upper flammability : 9.6%

Lower flammability : 1.8%

Relative density : No data available

Solubility : No data available

Partition coefficient : No data available
Auto-ignition temperature : 465°C / 869°F
Decomposition temperature : No data available
Viscosity : Not applicable

	Isobutylene	Oxygen	Nitrogen		
Molecular weight (grams)	56.1	32.00	28.013		
Boiling point	-6.9 °C	-182.9 °C	-196 °C		
Vapor pressure	164.4 kPa @ 21.1 °C	Above critical temperature	Above critical temperature		
Vapor density at 20°C	1.997	1.11	0.97		
Relative gas density	2.396 kg/m^3 @ 20 °C	1.331	1.153		
Critical Temperature	144.73 °C	-118.6 °C	-146.9 °C		

Section 10. STABILITY AND REACTIVITY

10.1. Reactivity

No reactivity hazard other than the effects described below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

10.4. Conditions to avoid

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

10.5. Incompatible materials

None known

10.6. Hazardous decomposition products

None known

Section 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Nitrogen (7727-37-9)

LC50 inhalation rat (ppm) 410,000 ppm/4h

Oxygen (7782-44-7)

LC50 inhalation rat (ppm) 400,000 ppm/4h

Isobutylene (115-11-7)

LC50 inhalation rat mg/L 620 mg/L /4h

11.1. Information on routes of exposure

Inhalation	: Adverse effects not expected from this product
Skin contact	: Adverse effects not expected from this product
Eye contact	: Adverse effects not expected from this product
Ingestion	: Ingestion is not considered a potential route of exposure

11.2. Symptoms related to physical, chemical and toxicological characteristics

Symptoms	: No information available

11.3. Delayed and immediate effects

Skin corrosion/irritation	: Contact with rapidly expanding gas may cause burns or frostbite.
Serious eye damage/irritation	: Contact with rapidly expanding gas may cause burns or frostbite.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Developmental Toxicity	: Not classified
Specific target organ toxicity (single exposure)	: Not classified
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified Not applicable for gases and gas-mixtures

11.4. Carcinogenic effects

The components of this material are not found on the following lists: FEDERAL OSHA Z LIST, NTP AND IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

Section 12. ECOLOGICAL INFORMATION

12.1. Aquatic Toxicity

Ecology - general	: No ecological damage caused by this product

12.2. Persistence and degradability

No information available for the product

12.3. Bioaccumulative potential

No information available for the product

12.4. Mobility in soil

No information available for the product

12.5. Other

No information available for the product

Section 13. DISPOSAL CONSIDERATIONS

13.1. Disposal methods

Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14. TRANSPORATION INFORMATION

	US DOT	TDG	IMDG	IATA
UN #	UN 1956	UN 1956	UN 1956	UN 1956
Proper shipping name	Compressed gas, n.o.s. (Nitrogen, Oxygen)	Compressed gas, n.o.s. (Nitrogen, Oxygen)	Compressed gas, n.o.s. (Nitrogen, Oxygen)	Compressed gas, n.o.s. (Nitrogen, Oxygen)
Transport hazard class(es)	2.2	2.2	2.2	2.2
Packing group	-	-	-	-
Environment	No.	No.	No.	No.

Section 15. REGULATORY INFORMATION

15.1. US Federal regulations

SARA 311/312 hazard categories

Acute Health	: No
Chronic Health	: No
Fire	: No
Pressure	: Yes
Reactive	: No

SARA Title III Notifications and Information: None known	
This product does not contain toxic chemicals subject to reporting requirements of section 313 of the Emergency planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.	
SARA 311/312	Sudden Release of Pressure Hazard

15.2. US State regulations

Nitrogen (007727-37-9)
U.S. - Massachusetts - Right To Know List
U.S. - Minnesota - Right To Know Hazardous Substance List
U.S. - New Jersey - Right To Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right To Know) List
Oxygen (007782-44-7)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right To Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right To Know) List
Isobutylene (115-11-7)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right To Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right To Know) List

Section 16. OTHER INFORMATION

Date of issue/Date of revision : New SDS 3/1/2015

Revision Note : Initial release

Hazardous Material Information System (USA)

Hazard Scale : 0 = Minimal/ 1 = Slight/ 2 = Moderate/ 3 = Serious/ 4 = Severe

Health : 0

Fire : 0

Physical hazards : 3

Key/Legend

SARA	Superfund Amendments and Reauthorization Act
OSHA	Occupational Safety and Health Administration
DOT	Department of Transportation
TSCA	Toxic Substance Control Act
NTP	National Toxicology Program
ACGIH	American Conference of Governmental Industrial Hygienists
PEL	Permissible Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TDG	Transportation of Dangerous Goods
CAS	Chemical Abstracts Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
TWA	Time Weighted Average
Prop	Proposition
ATE	Acute Toxicity Estimate

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Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose (s).

SAFETY DATA SHEET

1. Identification

Product identifier	**UNLEADED GASOLINE**
Other means of identification	
SDS number	002-GHS
Synonyms	Regular/Premium/Midgrade - Unleaded Gasoline, RFG - Reformulated Unleaded Gasoline, Conventional Unleaded Gasoline, Oxygenated Unleaded Gasoline, Non-Oxygenated Unleaded Gasoline, CARB (California Air Resource Board) Unleaded Gasoline, RBOB - Reformulated Blendstock for Oxygenate Blending, CBOB - Conventional Blendstock for Oxygenate Blending, Petrol, Motor Fuel. See section 16 for complete information.
Recommended use	Motor Fuel Motor fuels.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer/Supplier	Valero Marketing & Supply Company and Affiliates One Valero Way San Antonio, TX 78269-6000
General Assistance	210-345-4593
E-Mail	CorpHSE@valero.com
Contact Person	Industrial Hygienist
Emergency Telephone	24 Hour Emergency 866-565-5220 1-800-424-9300 (CHEMTREC USA)

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 1
Health hazards	Skin corrosion/irritation	Category 2
	Germ cell mutagenicity	Category 1B
	Carcinogenicity	Category 1B
	Reproductive toxicity	Category 2
	Specific target organ toxicity, single exposure	Category 3 narcotic effects
	Specific target organ toxicity, repeated exposure	Category 2
	Aspiration hazard	Category 1
Environmental hazards	Hazardous to the aquatic environment, long-term hazard	Category 2
OSHA defined hazards	Not classified.	

Label elements

Signal word	Danger
Hazard statement	Extremely flammable liquid and vapor. Causes skin irritation. May cause genetic defects. May cause cancer. Suspected of damaging fertility or the unborn child. May cause drowsiness or dizziness. May cause damage to organs (blood, liver, kidney) through prolonged or repeated exposure. May be fatal if swallowed and enters airways. Toxic to aquatic life with long lasting effects.

Precautionary statement

Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. 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. Do not breathe gas/mist/vapors/spray. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection. Use only outdoors or in a well-ventilated area. Avoid release to the environment.
Response	If exposed or concerned: Get medical advice/attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. In case of fire: Use alcohol-resistant foam, carbon dioxide, dry powder or water fog for extinction. Collect spillage.
Storage	Store locked up. Store in a well-ventilated place. Keep container tightly closed. Keep cool.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Gasoline	86290-81-5	80-100
Toluene	108-88-3	0-30
Hexane (Other Isomers)	96-14-0	5-25
Xylene (o, m, p isomers)	1330-20-7	0-25
Octane (All isomers)	111-65-9	0-18.5
Ethanol	64-17-5	0-10
1,2,4, Trimethylbenzene	95-63-6	0-6
n-Heptane	142-82-5	1-5
Pentane	109-66-0	1-5
Cumene	98-82-8	0-5
Ethylbenzene	100-41-4	0-5
Benzene	71-43-2	0-4.9
n-Hexane	110-54-3	0-3
Cyclohexane	110-82-7	0-3

4. First-aid measures

Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
Skin contact	Remove contaminated clothing and shoes. Wash off immediately with soap and plenty of water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes. If high pressure injection under the skin occurs, always seek medical attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.
Ingestion	Rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Do not give mouth-to-mouth resuscitation. If vomiting occurs, keep head low so that stomach content does not get into the lungs. Never give anything by mouth to a victim who is unconscious or is having convulsions. Get medical attention immediately.
Most important symptoms/effects, acute and delayed	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Cyanosis (blue tissue condition, nails, lips, and/or skin). Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash.

Indication of immediate medical attention and special treatment needed	In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	If exposed or concerned: get medical attention/advice. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use.

5. Fire-fighting measures

Suitable extinguishing media	Water spray. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use a solid water stream as it may scatter and spread fire.
Specific hazards arising from the chemical	Vapor may cause flash fire. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.
Special protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire-fighting equipment/instructions	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Withdraw immediately in case of rising sound from venting safety devices or any discoloration of tanks due to fire. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray. Cool containers exposed to flames with water until well after the fire is out. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Vapors may form explosive air mixtures even at room temperature. Prevent buildup of vapors or gases to explosive concentrations. Some of these materials, if spilled, may evaporate leaving a flammable residue. Water runoff can cause environmental damage. Use compatible foam to minimize vapor generation as needed.
Specific methods	Use water spray to cool unopened containers.
General fire hazards	Extremely flammable liquid and vapor. Containers may explode when heated.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Local authorities should be advised if significant spills cannot be contained. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See Section 8 of the SDS for Personal Protective Equipment.
Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if you can do so without risk. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Dike the spilled material, where this is possible. Prevent entry into waterways, sewers, basements or confined areas. Use non-sparking tools and explosion-proof equipment. Small Spills: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. This material and its container must be disposed of as hazardous waste. Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent product from entering drains. Do not allow material to contaminate ground water system. Should not be released into the environment.
Environmental precautions	Gasoline may contain oxygenated blend products (Ethanol, etc.) that are soluble in water and therefore precautions should be taken to protect surface and groundwater sources from contamination. If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Extremely flammable. Review Firefighting Measures, Section 5, before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g. by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Use compatible foam to minimize vapor generation as needed. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 1-800-424-8802.

7. Handling and storage

Precautions for safe handling

Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity.
Wear personal protective equipment. Do not breathe dust/fume/gas/mist/vapors/spray. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Avoid prolonged exposure. Use only with adequate ventilation. Wash thoroughly after handling. The product is extremely flammable, and explosive vapor/air mixtures may be formed even at normal room temperatures. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. When using, do not eat, drink or smoke. Avoid release to the environment.

Conditions for safe storage, including any incompatibilities

Flammable liquid storage. Do not handle or store near an open flame, heat or other sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. The pressure in sealed containers can increase under the influence of heat. Keep container tightly closed in a cool, well-ventilated place. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Cumene (CAS 98-82-8)	PEL	245 mg/m3
		50 ppm
Cyclohexane (CAS 110-82-7)	PEL	1050 mg/m3
		300 ppm
Ethanol (CAS 64-17-5)	PEL	1900 mg/m3
		1000 ppm
Ethylbenzene (CAS 100-41-4)	PEL	435 mg/m3
		100 ppm
n-Heptane (CAS 142-82-5)	PEL	2000 mg/m3
		500 ppm
n-Hexane (CAS 110-54-3)	PEL	1800 mg/m3
		500 ppm
Octane (All isomers) (CAS 111-65-9)	PEL	2350 mg/m3
		500 ppm
Pentane (CAS 109-66-0)	PEL	2950 mg/m3
		1000 ppm
Xylene (o, m, p isomers) (CAS 1330-20-7)	PEL	435 mg/m3
		100 ppm

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value
Benzene (CAS 71-43-2)	Ceiling	25 ppm
	TWA	10 ppm
Toluene (CAS 108-88-3)	Ceiling	300 ppm
	TWA	200 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
1,2,4, Trimethylbenzene (CAS 95-63-6)	TWA	25 ppm
Benzene (CAS 71-43-2)	STEL	2.5 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
	TWA	0.5 ppm
Cumene (CAS 98-82-8)	TWA	50 ppm
Cyclohexane (CAS 110-82-7)	TWA	100 ppm
Ethanol (CAS 64-17-5)	STEL	1000 ppm
Ethylbenzene (CAS 100-41-4)	TWA	20 ppm
Gasoline (CAS 86290-81-5)	STEL	500 ppm
	TWA	300 ppm
Hexane (Other Isomers) (CAS 96-14-0)	STEL	1000 ppm
	TWA	500 ppm
n-Heptane (CAS 142-82-5)	STEL	500 ppm
	TWA	400 ppm
n-Hexane (CAS 110-54-3)	TWA	50 ppm
Octane (All isomers) (CAS 111-65-9)	TWA	300 ppm
Pentane (CAS 109-66-0)	TWA	600 ppm
Toluene (CAS 108-88-3)	TWA	20 ppm
Xylene (o, m, p isomers) (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
1,2,4, Trimethylbenzene (CAS 95-63-6)	TWA	125 mg/m3
		25 ppm
Benzene (CAS 71-43-2)	STEL	1 ppm
	TWA	0.1 ppm
Cumene (CAS 98-82-8)	TWA	245 mg/m3
		50 ppm
Cyclohexane (CAS 110-82-7)	TWA	1050 mg/m3
		300 ppm
Ethanol (CAS 64-17-5)	TWA	1900 mg/m3
		1000 ppm
Ethylbenzene (CAS 100-41-4)	STEL	545 mg/m3
		125 ppm
	TWA	435 mg/m3
		100 ppm
Hexane (Other Isomers) (CAS 96-14-0)	Ceiling	1800 mg/m3
		510 ppm
	TWA	350 mg/m3
		100 ppm
n-Heptane (CAS 142-82-5)	Ceiling	1800 mg/m3
		440 ppm
	TWA	350 mg/m3
		85 ppm
n-Hexane (CAS 110-54-3)	TWA	180 mg/m3
		50 ppm
Octane (All isomers) (CAS 111-65-9)	Ceiling	1800 mg/m3
		385 ppm
	TWA	350 mg/m3
		75 ppm
Pentane (CAS 109-66-0)	Ceiling	1800 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
		610 ppm
	TWA	350 mg/m3
		120 ppm
Toluene (CAS 108-88-3)	STEL	560 mg/m3
		150 ppm
	TWA	375 mg/m3
		100 ppm
Xylene (o, m, p isomers) (CAS 1330-20-7)	STEL	655 mg/m3
		150 ppm
	TWA	435 mg/m3
		100 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Benzene (CAS 71-43-2)	25 µg/g	S-Phenylmercapturic acid	Creatinine in urine	*
Ethylbenzene (CAS 100-41-4)	0.7 g/g	Sum of mandelic acid and phenylglyoxylic acid	Creatinine in urine	*
n-Hexane (CAS 110-54-3)	0.4 mg/l	2,5-Hexanedi - on, without hydrolysis		*
	0.4 mg/l	2,5-Hexanedion, without hydrolysis	Urine	*
Toluene (CAS 108-88-3)	0.3 mg/g	o-Cresol, with hydrolysis	Creatinine in urine	*
	0.03 mg/l	Toluene	Urine	*
	0.02 mg/l	Toluene	Blood	*
Xylene (o, m, p isomers) (CAS 1330-20-7)	1.5 g/g	Methylhippuric acids	Creatinine in urine	*

* - For sampling details, please see the source document.

Exposure guidelines

US - California OELs: Skin designation

Benzene (CAS 71-43-2)	Can be absorbed through the skin.
Cumene (CAS 98-82-8)	Can be absorbed through the skin.
n-Hexane (CAS 110-54-3)	Can be absorbed through the skin.
Toluene (CAS 108-88-3)	Can be absorbed through the skin.

US - Minnesota Haz Subs: Skin designation applies

Cumene (CAS 98-82-8)	Skin designation applies.
Toluene (CAS 108-88-3)	Skin designation applies.

US - Tennesse OELs: Skin designation

Cumene (CAS 98-82-8)	Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Benzene (CAS 71-43-2)	Can be absorbed through the skin.
n-Hexane (CAS 110-54-3)	Can be absorbed through the skin.

US. NIOSH: Pocket Guide to Chemical Hazards

Cumene (CAS 98-82-8)	Can be absorbed through the skin.

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Cumene (CAS 98-82-8)	Can be absorbed through the skin.

Appropriate engineering controls

Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses. If splash potential exists, wear full face shield or chemical goggles.
Skin protection	
Hand protection	Avoid exposure - obtain special instructions before use. Wear protective gloves. Be aware that the liquid may penetrate the gloves. Frequent change is advisable. Suitable gloves can be recommended by the glove supplier.
Other	Wear chemical-resistant, impervious gloves. Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended.
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn. Proper respirator selection should be determined by adequately trained personnel, based on the contaminants, the degree of potential exposure and published respiratory protection factors. This equipment should be available for nonroutine and emergency use.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Consult supervisor for special handling instructions. Avoid contact with eyes. Avoid contact with skin. Keep away from food and drink. Wash hands before breaks and immediately after handling the product. Provide eyewash station and safety shower. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance	Light straw to red clear liquid with characteristic strong odor of gasoline.
Physical state	Liquid.
Form	Liquid.
Color	Light straw to red clear.
Odor	Characteristic Gasoline Odor (Strong).
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	44.01 °F (6.67 °C) May start to solidify at this temperature. This is based on data for the following ingredient: Cyclohexane. Weighted average: -91.9 deg C (-133.4 deg F)
Initial boiling point and boiling range	80.06 - 440.06 °F (26.7 - 226.7 °C)
Flash point	-40.0 °F (-40.0 °C) (closed cup)
Evaporation rate	10 - 11 BuAc
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	1.3 %
Flammability limit - upper (%)	7.1 %
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	60.8 - 101.3 kPa (20°C)
Vapor density	3 - 4 (Air=1)
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Very slightly soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	> 500 °F (> 260 °C)
Decomposition temperature	Not available.
Viscosity	Not available.

Other information

Flash point class	Flammable IA
VOC (Weight %)	100 %

10. Stability and reactivity

Reactivity	None known.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat, flames and sparks. Ignition sources. Contact with incompatible materials. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Swallowing or vomiting of the liquid may result in aspiration into the lungs.
Inhalation	In high concentrations, mists/vapors may irritate throat and respiratory system and cause coughing. May cause drowsiness or dizziness.
Skin contact	Causes skin irritation. Prolonged contact may cause dryness of the skin.
Eye contact	May cause eye irritation.
Symptoms related to the physical, chemical and toxicological characteristics	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Cyanosis (blue tissue condition, nails, lips, and/or skin). Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash.

Information on toxicological effects

Acute toxicity Based on available data, the classification criteria are not met.

Components	Species	Test Results
1,2,4, Trimethylbenzene (CAS 95-63-6)		
Acute		
Dermal		
LD50	Rabbit	> 3160 mg/kg
Inhalation		
LC50	Rat	> 2000 mg/l, 48 Hours
Oral		
LD50	Rat	6 g/kg
Benzene (CAS 71-43-2)		
Acute		
Oral		
LD50	Rat	3306 mg/kg
Cumene (CAS 98-82-8)		
Acute		
Inhalation		
LC50	Mouse	2000 mg/l, 7 Hours
	Rat	8000 mg/l, 4 Hours
Oral		
LD50	Rat	1400 mg/kg
Cyclohexane (CAS 110-82-7)		
Acute		
Oral		
LD50	Rat	12705 mg/kg

Components	Species	Test Results
Ethanol (CAS 64-17-5)		
Acute		
Inhalation		
LC50	Rat	30000 mg/m3
Ethylbenzene (CAS 100-41-4)		
Acute		
Dermal		
LD50	Rabbit	> 5000 mg/kg
Oral		
LD50	Rat	5.46 g/kg
n-Heptane (CAS 142-82-5)		
Acute		
Inhalation		
LC50	Rat	103 mg/l, 4 Hours
n-Hexane (CAS 110-54-3)		
Acute		
Oral		
LD50	Rat	28710 mg/kg
Octane (All isomers) (CAS 111-65-9)		
Acute		
Inhalation		
LC50	Rat	118 mg/l, 4 Hours
Pentane (CAS 109-66-0)		
Acute		
Inhalation		
LC50	Rat	364 mg/l, 4 Hours
Toluene (CAS 108-88-3)		
Acute		
Dermal		
LD50	Rabbit	14.1 ml/kg
Inhalation		
LC50	Rat	8000 mg/l, 4 Hours
Oral		
LD50	Rat	2.6 g/kg
Xylene (o, m, p isomers) (CAS 1330-20-7)		
Acute		
Oral		
LD50	Rat	4300 mg/kg

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Based on available data, the classification criteria are not met.

Respiratory or skin sensitization

Respiratory sensitization Based on available data, the classification criteria are not met.

Skin sensitization Based on available data, the classification criteria are not met.
This substance may have a potential for sensitization which may provoke an allergic reaction among sensitive individuals.

Germ cell mutagenicity May cause genetic defects.
In in-vitro experiments, neither benzene, toluene nor xylene changed the number of sister-chromatid exchanges (SCEs) or the number of chromosomal aberrations in human lymphocytes. However, toluene and xylene caused a significant cell growth inhibition which was not observed with benzene in the same concentrations. In in-vivo experiments, toluene changed the number of sister-chromatid exchanges (SCEs) in human lymphocytes. Toluene may cause heritable genetic damage.

Carcinogenicity May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

Benzene (CAS 71-43-2)	1 Carcinogenic to humans.
Cumene (CAS 98-82-8)	2B Possibly carcinogenic to humans.
Ethylbenzene (CAS 100-41-4)	2B Possibly carcinogenic to humans.
Gasoline (CAS 86290-81-5)	2B Possibly carcinogenic to humans.
Toluene (CAS 108-88-3)	3 Not classifiable as to carcinogenicity to humans.
Xylene (o, m, p isomers) (CAS 1330-20-7)	3 Not classifiable as to carcinogenicity to humans.

NTP Report on Carcinogens

Benzene (CAS 71-43-2)	Known To Be Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Benzene (CAS 71-43-2)	Cancer

Reproductive toxicity Suspected of damaging fertility or the unborn child.
Benzene, xylene and toluene have demonstrated animal effects of reproductive toxicity. Animal studies of benzene have shown testicular effects, alterations in reproductive cycles, chromosomal aberrations and embryo/fetotoxicity. Ethanol has demonstrated human effects of reproductive toxicity. Can cause adverse reproductive effects - such as birth defects, miscarriages, or infertility. Avoid exposure to women during early pregnancy. Avoid contact during pregnancy/while nursing.

Specific target organ toxicity - single exposure May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure May cause damage to the following organs through prolonged or repeated exposure: Blood. Kidneys. Liver.

Aspiration hazard May be fatal if swallowed and enters airways.

Chronic effects Repeated exposure of laboratory animals to high concentrations of gasoline vapors has caused kidney damage and cancer in rats and cancer in mice. Gasoline was evaluated for genetic activity in assays using microbial cells, cultured mammalian cells and rat bone marrow cells. The results were all negative so gasoline was considered nonmutagenic under these conditions. Overexposure to this product or its components has been suggested as a cause of liver abnormalities in laboratory animals and humans. Lifetime studies by the American Petroleum Institute have shown that kidney damage and kidney cancer can occur in male rats after prolonged inhalation exposures at elevated concentrations of total gasoline. Kidneys of mice and female rats were unaffected. The U.S. EPA Risk Assessment Forum has concluded that the male rat kidney tumor results are not relevant for humans. Total gasoline exposure also produced liver tumors in female mice only. The implication of these data for humans has not been determined.

Further information Symptoms may be delayed.

12. Ecological information

Ecotoxicity Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Components		Species	Test Results
1,2,4, Trimethylbenzene (CAS 95-63-6)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	7.19 - 8.28 mg/l, 96 hours
Benzene (CAS 71-43-2)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	8.76 - 15.6 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	7.2 - 11.7 mg/l, 96 hours
Cumene (CAS 98-82-8)			
Aquatic			
Crustacea	EC50	Brine shrimp (Artemia sp.)	3.55 - 11.29 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	2.7 mg/l, 96 hours
Cyclohexane (CAS 110-82-7)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	3.961 - 5.181 mg/l, 96 hours
		Striped bass (Morone saxatilis)	8.3 mg/l, 96 hours

Components		Species	Test Results
Ethanol (CAS 64-17-5)			
Aquatic			
Algae	EC50	Freshwater algae	275 mg/l, 72 Hours
		Marine water algae	1970 mg/l
Fish	LC50	Fathead minnow (Pimephales promelas)	> 100 mg/l, 96 hours
		Freshwater fish	11200 mg/l, 96 Hours
Invertebrate	EC50	Freshwater invertebrate	5012 mg/l, 48 Hours
		Marine water invertebrate	857 mg/l, 48 Hours
Ethylbenzene (CAS 100-41-4)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	1 - 4 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	4 mg/l, 96 hours
n-Heptane (CAS 142-82-5)			
Aquatic			
Fish	LC50	Western mosquitofish (Gambusia affinis)	4924 mg/l, 96 hours
n-Hexane (CAS 110-54-3)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	2.101 - 2.981 mg/l, 96 hours
Toluene (CAS 108-88-3)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	5.46 - 9.83 mg/l, 48 hours
Fish	LC50	Pink salmon (Oncorhynchus gorbuscha)	6.86 - 8.48 mg/l, 96 hours
Xylene (o, m, p isomers) (CAS 1330-20-7)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	8 mg/l, 96 Hours

Persistence and degradability Not available.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)

Benzene (CAS 71-43-2)	2.13
Cumene (CAS 98-82-8)	3.66
Cyclohexane (CAS 110-82-7)	3.44
Ethanol (CAS 64-17-5)	-0.31
Ethylbenzene (CAS 100-41-4)	3.15
Hexane (Other Isomers) (CAS 96-14-0)	3.6
Octane (All isomers) (CAS 111-65-9)	5.18
Pentane (CAS 109-66-0)	3.39
Toluene (CAS 108-88-3)	2.73
Xylene (o, m, p isomers) (CAS 1330-20-7)	3.2
n-Heptane (CAS 142-82-5)	4.66
n-Hexane (CAS 110-54-3)	3.9

Mobility in soil Not available.

Other adverse effects Not available.

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. This material and its container must be disposed of as hazardous waste. Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

Hazardous waste code D001: Waste Flammable material with a flash point <140 °F
D018: Waste Benzene

US RCRA Hazardous Waste U List: Reference

Benzene (CAS 71-43-2)	U019
Cumene (CAS 98-82-8)	U055
Cyclohexane (CAS 110-82-7)	U056
Toluene (CAS 108-88-3)	U220
Xylene (o, m, p isomers) (CAS 1330-20-7)	U239

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Offer rinsed packaging material to local recycling facilities.

14. Transport information

DOT

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	Yes
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	139, B33, B101, T8
Packaging exceptions	150
Packaging non bulk	202
Packaging bulk	242

IATA

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II
Environmental hazards	Yes
ERG Code	3H
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II
Environmental hazards	
Marine pollutant	Yes
EmS	F-E, S-E
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable. However, this product is a liquid and if transported in bulk covered under MARPOL 73/78, Annex I.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Benzene (CAS 71-43-2)	Cancer

Central nervous system
Blood
Aspiration
Skin
Eye
Respiratory tract irritation
Flammability

CERCLA Hazardous Substance List (40 CFR 302.4)

Benzene (CAS 71-43-2)	LISTED
Cumene (CAS 98-82-8)	LISTED
Cyclohexane (CAS 110-82-7)	LISTED
Ethanol (CAS 64-17-5)	LISTED
Ethylbenzene (CAS 100-41-4)	LISTED
Gasoline (CAS 86290-81-5)	LISTED
Hexane (Other Isomers) (CAS 96-14-0)	LISTED
n-Heptane (CAS 142-82-5)	LISTED
n-Hexane (CAS 110-54-3)	LISTED
Octane (All isomers) (CAS 111-65-9)	LISTED
Pentane (CAS 109-66-0)	LISTED
Toluene (CAS 108-88-3)	LISTED
Xylene (o, m, p isomers) (CAS 1330-20-7)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Toluene	108-88-3	0-30
Xylene (o, m, p isomers)	1330-20-7	0-25
1,2,4, Trimethylbenzene	95-63-6	0-6
Cumene	98-82-8	0-5
Ethylbenzene	100-41-4	0-5
Benzene	71-43-2	0-4.9
n-Hexane	110-54-3	0-3
Cyclohexane	110-82-7	0-3

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Ethylbenzene (CAS 100-41-4)
n-Hexane (CAS 110-54-3)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Pentane (CAS 109-66-0)

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Toluene (CAS 108-88-3) 6594

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Toluene (CAS 108-88-3) 35 % weight/volumn

DEA Exempt Chemical Mixtures Code Number

Toluene (CAS 108-88-3) 594

US state regulations

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethanol (CAS 64-17-5)
Ethylbenzene (CAS 100-41-4)
Hexane (Other Isomers) (CAS 96-14-0)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
Octane (All isomers) (CAS 111-65-9)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. New Jersey Worker and Community Right-to-Know Act

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethanol (CAS 64-17-5)
Ethylbenzene (CAS 100-41-4)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
Octane (All isomers) (CAS 111-65-9)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. Pennsylvania Worker and Community Right-to-Know Law

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethanol (CAS 64-17-5)
Ethylbenzene (CAS 100-41-4)
Gasoline (CAS 86290-81-5)
Hexane (Other Isomers) (CAS 96-14-0)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
Octane (All isomers) (CAS 111-65-9)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. Rhode Island RTK

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethylbenzene (CAS 100-41-4)
n-Hexane (CAS 110-54-3)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Ethylbenzene (CAS 100-41-4)
Toluene (CAS 108-88-3)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

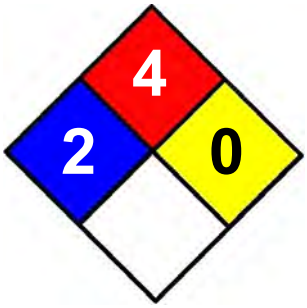
Issue date 13-May-2013

Revision date 23-May-2014

Version # 03

Further information HMIS® is a registered trade and service mark of the NPCA.

NFPA Ratings



References

ACGIH
EPA: AQUIRE database
NLM: Hazardous Substances Data Base
US. IARC Monographs on Occupational Exposures to Chemical Agents
HSDB® - Hazardous Substances Data Bank
IARC Monographs. Overall Evaluation of Carcinogenicity
National Toxicology Program (NTP) Report on Carcinogens
ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices

Disclaimer

This material Safety Data Sheet (SDS) was prepared in accordance with 29 CFR 1910.1200 by Valero Marketing & Supply Co., ("VALERO"). VALERO does not assume any liability arising out of product use by others. The information, recommendations, and suggestions presented in this SDS are based upon test results and data believed to be reliable. The end user of the product has the responsibility for evaluating the adequacy of the data under the conditions of use, determining the safety, toxicity and suitability of the product under these conditions, and obtaining additional or clarifying information where uncertainty exists. No guarantee expressed or implied is made as to the effects of such use , the results to be obtained, or the safety and toxicity of the product in any specific application. Furthermore, the information herein is not represented as absolutely complete, since it is not practicable to provide all the scientific and study information in the format of this document, plus additional information may be necessary under exceptional conditions of use, or because of applicable laws or government regulations.

ATTACHMENT D

JOB LOSS ANALYSES AND

DAILY SITE SAFETY CHECKLISTS

Job Loss Analysis (JLA)

JLA Title: Fleet Vehicle Pre-Driving Inspection

Date Developed: 12/31/2015	**Revised Date:** 1/4/2023
Initial Development Team: Daniel Zordan, JR Engineer / Brian Simons, JR Geologist	
Latest Revision by: Mark Lancaster, RHSM	
Quality Review by: Mark Lancaster, RHSM	

Revision #: 006

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Air Purifying Respirator; ☐Ear Muffs; ☐Ear Plugs; ☐Face Shield; ☐Fire Retardant Clothing; ☒Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Goggles; ☐Hard Hat; ☒Safety Glasses; ☒Safety-toed Boots; ☒Shirt (Highly-Visible Short/Long Sleeve); ☐Tychem Suit; ☐Tyvek Suit; ☒Vest (Highly Visible Reflective Striped); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: Sorbent sock/ pillows, LEL meter

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Inspect exterior of fleet vehicle for damage or non-working equipment	**1a.** Fractures/ contusions to the arms/legs/torso/head due to contact with a moving vehicle **1b.** Hand and arm fractures or contusions as a result of tripping and falling over equipment/debris remaining around vehicle **1c.** Cuts to fingers or hands due to contact with broken or sharp area of vehicle during inspection of equipment (tires, lights, under body...	**1a.** Ensure vehicle, prior to inspection, is located in an area away from third party hazards (vehicle or pedestrian traffic). ➢ Ensure inspection is completed in a well lit area and area has been scanned for any security threats (third party concerns). ➢ During demobilization from work site ensure traffic controls around vehicle are in place. ➢ Don high visible clothing (i.e. safety vest or hi-visible shirt); upgrade to hi-visible florescent stripped garments during early morning or dusk hours, including inclement weather (rain, fog, snow fall). **1b.** Inspect path and space around vehicle for any uneven surfaces or objects (debris, tools / equipment) that mat create a trip hazard. ➢ Inspect area for hazards created by weather (i.e. rain and deep puddles or snow and ice). ➢ Don safety shoes. ➢ Don high visible clothing (i.e. safety vest or hi-visible shirt); upgrade to hi-visible florescent stripped garments during early morning or dusk hours, including inclement weather (rain, fog, snow fall). **1c.** Complete a visual inspection before attempting to touch any potential area on vehicle that may be damaged. (I.e. do not place hands anywhere on / under vehicle until it is visually safe to do so). ➢ If any area of vehicle is damaged (broken lights, damaged to body, visible sign of fluid leaks (undercarriage), wear of vehicle tire treads), do not drive vehicle; contact office leadership (supervisor) and note conditions. ➢ Don Safety glasses, hard hat, and leather gloves. ➢ Don high visible clothing (i.e. safety vest or hi-visible shirt); upgrade to hi-visible florescent stripped garments during early morning or dusk hours, including inclement weather (rain, fog, snow fall). ***NOTE:*** *Individuals performing vehicle inspection must be trained and have familiarity with the vehicle and its operating requirements. Refer to operations manual.*
2. Check vehicle fluids (oil, transmission, windshield washer, power steering, brake fluid and / or coolant) .	**2a.** Amputation/cuts to hand/fingers, arm due to contact with hood latch of vehicle or engine parts. **2b.** Skin irritation to hands, arms or face due to contact with engine fluids	**2a.** Prior to opening hood visually inspect area to identify hood and latch; do not use hands to find latch. ➢ Open the hood of the vehicle slowly and secure it open with the hood prop (where applicable); double check to ensure hood prop is not damaged and is secured to hood. ➢ Inspect hood hinges to ensure hood will remain in upright position and not fall on individual. ➢ Prior to checking fluids visually inspect areas to ensure no sharp edges or metal points that could create a cut hazard. ➢ Don safety glasses, hard hat, and leather gloves. ➢ Don high visible clothing (i.e. safety vest or hi-visible shirt); upgrade to hi-visible florescent stripped garments during early morning or dusk hours, including inclement weather (rain, fog, snow fall). ***NOTE:*** *At no time should an under the hood inspection take place if vehicle engine is hot* **2b.** AGAIN – no under hood inspection shall take place if engine is hot. If engine has been running (utilized for on-site work) then vehicle should be turned off and allowed to cool, no less than 15 minutes) ➢ Review SDS to understand vehicle fluids, exposure / symptoms and first aid measures. ➢ When removing fluid level indicator (dip stick) remove slowly to minimize splashing fluids onto body. ➢ Utilize a paper towel or cloth to wipe dip stick clean, do not use hand.

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

	2c. Burns to the eyes/skin due to contact with hot engine fluids.	➢ Avoid coming into contact with any engine fluids. ➢ Don safety glasses, hard hat and nitrile over cut resistant gloves. ➢ Don high visible clothing (i.e. safety vest or hi-visible shirt); upgrade to hi-visible florescent stripped garments during early morning or dusk hours, including inclement weather (rain, fog, snow fall). **2c.** Review SDS to understand vehicle fluids, exposure / symptoms and first aid measures. ➢ When removing fluid level indicator (dip stick) remove slowly to minimize splashing fluids into eyes. ➢ Have eye wash available in vehicle. ➢ Don safety glasses, hard hat and nitrile over cut resistant gloves. ➢ Don high visible clothing (i.e. safety vest or hi-visible shirt); upgrade to hi-visible florescent stripped garments during early morning or dusk hours, including inclement weather (rain, fog, snow fall).
3. Check tire pressure and condition to ensure that tire pressure is within manufacturers specifications indicated on the door jamb tag or manual	**3a.** Cuts or contusions to the hands or arms due to contact with sharp edges of wheel well of the vehicle. **3b.** Back/waist strain that could result from bending down at the waist	**3a.** Inspect vehicle wheel well for any sharp edges and loose or rusted metal. ➢ Do not run hands over tires, complete a visual inspection and look for any signs or wear (steel belts in tire exposed), cuts, bulges or damage; do not drive vehicle; contact office leadership (supervisor) or CHSSE immediately. ➢ Don safety glasses, hard hat and leather gloves. ➢ Don high visible clothing (i.e. safety vest or hi-visible shirt); upgrade to hi-visible florescent stripped garments during early morning or dusk hours, including inclement weather (rain, fog, snow fall). **3b.** Maintain required body position by keeping back straight; bend at knees to inspect tires and check tire pressure. ➢ Utilize knee pads or a pad if kneeling on ground ➢ Inspect ground for potential objects that may cut knees, legs. ➢ Don safety glasses, hard hat and leather gloves. ➢ Don high visible clothing (i.e. safety vest or hi-visible shirt); upgrade to hi-visible florescent stripped garments during early morning or dusk hours, including inclement weather (rain, fog, snow fall).
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

Job Loss Analysis (JLA)

JLA Title: Gauging Liquid Levels in Groundwater Monitoring Wells

Date Developed: 2/28/2005	**Revised Date:** 1/4/2023
Initial Development Team: Brian Brittain, Sr. Environ Tech/ Courtney Reese, PM	
Latest Revision by: Mark Lancaster, RHSM	
Quality Review by: Tom Baylis, CIH; VP, HSSE	

Revision #: 017

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Air Purifying Respirator; ☐Ear Muffs; ☐Ear Plugs; ☐Face Shield; ☐Fire Retardant Clothing; ☒Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Goggles; ☐Hard Hat; ☒Safety Glasses; ☒Safety-toed Boots; ☒Shirt (Highly-Visible Short/Long Sleeve); ☐Tychem Suit; ☐Tyvek Suit; ☐Vest (Highly Visible Reflective Striped); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: Click here to enter tools and equipment.

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
A. Locate Wells 1. Locate Wells	**1a.** Hand and arm fractures or contusions as a result of tripping and falling when walking or working on uneven surfaces **1b.** Fractures/contusions to body due to contact with moving vehicles.	**1a.** Inspect the work area and look for uneven areas that may create a tripping hazard. ➢ Plan walking path through work area to avoid the uneven areas ➢ If the path of travel is obstructed (lighting, over growth, clutter...) utilize a walking stick and probe ahead, walk slowly and use caution. ➢ Don safety boots with skid / puncture resistant soles that comply with GES requirements. **1b.** Utilize cones/barricades/safety fence to establish the work zone – Comply with GES Traffic Control program. ➢ Position work vehicle between work area and on-coming traffic. ➢ Do not permit access to work zone by non-essential personnel. ➢ Inform facility personnel of work (restricted) area. ➢ Use "spotter" to warn personnel of approaching vehicles in high traffic areas. ➢ Don high visible sleeved shirt or outerwear, such as high visible traffic vests or clothing. ➢ If working alongside an active roadway, where vehicular traffic is heavy, dawn/dusk hours, or if weather if overcast or rainy, high visible outwear with reflective stripping must be worn.
2. Inspect and Open Wells	**2a.** Skin punctures/bites from contact with debris/insects/animals inside well lid **2b.**Cuts or contusions to the hands, arms or other body parts due to contact with sharp edges of well, well lid or well box **2c.** Back/body sprain/strain from lifting, moving or carrying equipment/materials to well **2d.** Shoulder/muscle sprain resulting from using a socket wrench to loosen and remove bolts from the lid	2a. Visually inspect area around well lid for any signs of debris/insects/animals ➢ Clear any debris from around the well ➢ Remove lid towards you to allow any insects/animals to escape away from you ➢ Keep hands/arms away from well lid **2b.** Remove manhole covers so that they do not pinch fingers. ➢ Keep body parts (hands, fingers) out from between the lid and well opening. ➢ Use a crowbar/pry bar to remove the lid or cap ➢ Avoid kneeling or use kneeling pads when kneeling on hard and uneven surfaces. ➢ Don cut resistant gloves **2c.** Determine whether the item must be lifted - can it be left in place or pushed/pulled into place? ➢ Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees, not the waist, keep back and torso straight; don't twist. ➢ When carrying, keep load close to the body. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area **2d.** Ensure your wrists are straight when using a wrench. ➢ Be sure that the opening of the socket is in full contact with the bolt before you apply pressure. ➢ Pull, don't push/over-reach. Use a slow, steady motion. If the bolt cannot be loosened with normal force, contact office to discuss options. ➢ Kneel on a solid surface with one foot planted firmly on the floor – do not lean into the work. ➢ Don leather gloves. ***Note:*** *Never use hand sockets with power or impact wrenches. Replace sockets showing cracks or wear.*

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

	2e. Abrasions/Cuts to hands from contact with ground surface while loosening bolts from the well lid or removing gripper plug	**2e**. Use extension or a deep well socket on socket wrench to increase hand placement/distance to ground surface. ➢ Pull wrench to loosen bolts using a slow, steady motion ➢ Twist handle on top of gripper plug to flatten gasket and allow for easier removal ➢ Don Cut Resistant/Leather gloves
B. Conduct Liquid Gauging 1. Insert interface probe into well and record liquid level reading in site log book	**1a.** Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to hazardous atmosphere.	**1a.** Discuss and implement monitoring and action levels requirements stated in the HASP ➢ If organic vapors are present, replace the well cap and do not proceed until a PID is obtained to scan the atmosphere ensuring that concentrations are below 5 ppm. ➢ If respirator upgrade is required, contact PM, RHSSE/CHSSE before proceeding. ***Note:*** *Be aware that there may be elevated levels of gasoline or product vapors in the wells.*
C. Replace Well Plug and Cover	**1a.** Fractures or cuts to the fingers when securing well plug into well casing**.** **1b**. Fractures or cuts fingers when replacing well cover over well.	**1a.** Grasp well plug from the top bringing it straight down onto the well casing. ➢ Twist handle on top to flatten gasket and allow for easier insertion into the well ➢ Keep fingers away from the sides of the well plug and well casing while pushing down to secure it ➢ Ensure cut resistant gloves are donned **1b**. Slide lid over well opening, keeping fingers away from opening ➢ Use crowbar/pry bar to aide in placement of lid into annulus ➢ Keep fingers out from between the lid and annulus ➢ Ensure cut resistant gloves are donned
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

Job Loss Analysis (JLA)

JLA Title: Motor Vehicle Driving/Use

Date Developed: 9/15/2008	**Revised Date:** 1/5/2023
Initial Development Team: Jordan Wilcox, Jr. Env. Sci. / J. Pachy, RHSSE	
Latest Revision by: Kara Gioulis, RHSO	
Quality Review by: Tom Baylis, VP HSSE	

Revision #: 013

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Hard Hat; ☐Safety Glasses; ☐Safety-toed Boots; ☐Shirt (Highly-Visible Short/Long Sleeve); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: Fire extinguisher; First aid kit; Yellow flashing light; Roadside emergency kit

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
A. Conduct a pre-trip or pre-use inspection of the vehicle prior to driving as well as a vehicle walk around (360° inspection)	**1a** Hand and arm fractures or contusions as a result of tripping and falling when walking or working on uneven surfaces	**1a**. Inspect the work area and look for uneven areas that may create a tripping hazard. ➢ Plan walking path through work area to avoid the uneven areas ➢ Remove any material or equipment from pathway prior to conducting inspection ➢ Don hi-visible clothing, safety glasses, add leather gloves / nitrile gloves if handling any part of vehicle
B. Driving 1. Driving to and from the site or while driving onsite.	**1a**. Fractures /contusions due to contact with moving vehicles due to traffic conditions or other vehicles	**1a**. Ensure driver is awake / alert prior to departing and that, if driving with passenger they remain awake and alert during driving. ➢ Look ahead a minimum of 15 seconds to identify potential oncoming hazards. ➢ Maintain 4-second minimum following distance (increase distance due to weather conditions). ➢ Avoid focusing on any one object for more than 2 seconds. ➢ Scan the road, area around vehicle, and mirrors every 5-8 seconds. ➢ Stay out of other vehicles blind spots. ➢ Do not drive in clusters of traffic (i.e., adjust speed to give cushion between your vehicle and others). ➢ Utilize turn signals as required by law at all times ➢ Maintain speed; slower depending on road surface (e.g., dirt, concrete, asphalt, gravel). ➢ Drive posted speed limits (e.g., city, country roads, and highway). ➢ Do not tailgate vehicles in front of you. ➢ Pay attention for pedestrians. ➢ Check for and yield to emergency vehicles. ➢ Place two hands on steering wheel at 9 and 3 position. (or as steering wheel allows) ➢ Obey traffic signals. ➢ Use particular caution in construction zones. ➢ **NOTE***: All GES vehicles must be driven with low-beam head lights on. Also, Smoking is not permitted in GES vehicles.*
	1b. Fractures /contusions due to contact with moving vehicles while driving onsite	**1b.** Ensure driver is awake / alert prior to departing and that, if driving with passenger they remain awake and alert during driving. ➢ Drive slowly (less than 10 mph) while onsite and conduct the following: ➢ Pay attention for pedestrians. ➢ Check for and yield to emergency vehicles. ➢ Place two hands on steering wheel at 9 and 3 position (if applicable). ➢ Obey onsite signs or signals. ➢ Use particular caution near onsite work zone(s). ➢ When backing, use a spotter at all times and ensure that the pre-determined hand signals have been discussed during the tailgate meeting and implemented. ➢ Stay out of other vehicles blind spots. ➢ Make eye contact with other drivers and ensure they see you ➢ Seat belts must be worn by all occupants at all times while driving to and from the site and while driving onsite ➢ Cell phone usage and texting is not permitted at any time while driving. ➢ Prepare vehicle for weather conditions prior to departure. ➢ Snow/Ice ▪ Scrape snow/ice from entire vehicle (e.g., hood, roof, windows, etc.). ▪ Add extra weight to back of trucks to increase traction.

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

		▪ Maintain speed for conditions. ➢ Fog ▪ Turn on fog lights. ▪ Maintain for conditions. ➢ Rain ▪ Ensure windows are defogged prior to mobilization. ▪ Utilize windshield wipers in all rainy conditions. ▪ Consider alternative routes based on flooding potential of roadway. ▪ Maintain speed for conditions.
	1c. 3rd party injuries or accidents caused by unsecure equipment in truck bed	**1c**. Inspect truck bed load. ➢ Check coolers, drums, and toolboxes to make sure all lids, caps, and tops are latched and tightened. ➢ Use ratchet-straps to secure load from shifting or falling from truck bed. ➢ Close and lock tailgate before mobilizing to site. ➢ Place light objects that could be blown out of truck bed in cab ➢ Don safety glasses, leather gloves and hi-visible clothing when loading truck bed
C. Parking and accessing vehicle 1. Parking	**1a**. Fractures /contusions due to contact with moving vehicles	**1a**. Ensure driver is awake / alert prior to departing and that, if driving with passenger they remain awake and alert during driving. ➢ Maneuver vehicle slowly within parking lot. ➢ Ensure vehicle is legally parked. ➢ Back into space (required on Terminal sites and Natural Gas well pads). ➢ Ensure nothing is located at rear of vehicle prior to mobilization. ➢ Get out and inspect space and vehicle if unsure of potential or unseen hazards. ➢ **For automatic transmissions:** When parked, the vehicle must be placed into park and the emergency (parking brake applied). ➢ **For manual transmissions:** the emergency brake must be applied and wheel chocks used to prevent the vehicle from rolling ➢ Wheel chocks must be used for large vehicles when parked/positioned on uneven surfaces; front & back of each rear tire. ➢ Wheel chocks must be used (front & back of each rear tire) on all vehicles working at the site/ vehicles with manual transmission parked on sloping surfaces ➢ When parked and unhooked from a vehicle, trailers must have a wheel chock placed in front of and behind each rear wheel. ➢ Place vehicle between yourself and traffic, when possible ➢ Ensure vehicle cab and bed are locked before leaving the vehicle at the end of the task or day.
2. Accessing/working from vehicle	2a. Pinch point between tailgate and truck bed	2a. Do not place hands between truck bed and tailgate when opening or closing the tailgate
	2b. Cuts from contacting sharp edges on sides of open tailgate	2b. Be aware of sharp edges on sides of open tailgate; allow clearance when walking around vehicle
	2c. Muscle strain/sprain from over-reaching over side of bed	2c. Avoid reaching over side of bed to retrieve or move items; instead, climb into bed (using 3 points of contact) to relocate items towards back of bed for easier retrieval
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

Job Loss Analysis (JLA)

JLA Title: Poet System Water Sampling

Date Developed: 2/9/2005	**Revised Date:** 1/5/2023
Initial Development Team: Matt Depress, Field Scientist / Rich Brown, Tech manager	
Latest Revision: Kara Gioulis, Regional HSSE Manager	
Quality Review by: Basith Mohammed, Regional HSSE Manager	

Revision #: 016

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Air Purifying Respirator; ☐Ear Muffs; ☐Ear Plugs; ☐Face Shield; ☐Fire Retardant Clothing; ☒Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Goggles; ☒Hard Hat; ☒Safety Glasses; ☒Safety-toed Boots; ☒Shirt (Highly-Visible Short/Long Sleeve); ☐Tychem Suit; ☐Tyvek Suit; ☐Vest (Highly Visible Reflective Striped); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: Hand tools, a cart or dolly

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Sampling of System Water	**1a**. Skin irritation/ anaphylactic shock that could result from bites or stings from poisonous insects.	**1a**. Evaluate the area surrounding the POET system. Spray wasp/ hornet nests with insect repellent from a distance recommended by the manufacturer. Determine size and location of nest as professionals may have to be consulted. ➢ Visually inspect and carefully open any outside enclosures that insects and small animals could potentially enter. ➢ Don long sleeve shirt, long pants with socks pulled over legs to reduce the likelihood of ticks contacting the skin. ➢ Utilizing insect repellent with DEET is strongly recommended. Follow application instructions on bottle. ➢ Perform daily tick check, If ticks are found on the skin remove per GES protocol, and upgrade skin protection
	1b. Hand and arm fractures or contusions as a result of tripping and falling over equipment/debris remaining in work area	**1b**. Identify and remove any debris or non-essential equipment that is found in the work area to eliminate the tripping hazard. ➢ All tools, equipment of objects that may create a trip hazard must be placed in secured location or cleaned up and disposed of.
	1c. Irritation or burns to eyes, hand, arms and other body parts that result from skin contact with site contaminants, preservatives, and bleach from bacteria sampling	**1c**. Do not splash purged water on clothing or skin; pour slowly to avoid splashing ➢ Sample preservative may have leaked from a container or multiple containers; sample preservatives consist of various types of acids that include HCL, HNO3, and H2SO4 – hand and skin protection is necessary ➢ If handling chemicals, review MSDS/SDS and understand signs/symptoms of exposure and first aid measures. ➢ NOTE: Bleach is an irritant to skin and eyes. ➢ Don PPE (i.e., eye protection, long pants, nitrile sampling gloves, hard hats, long sleeve shirts, steel-toed boots), evaluate the need to upgrade PPE to poly Face shield or goggles, chemical resistance suite (Tyvek/Tychem) if there is a potential for splashing of the chemical to occur.
	1d. Cuts or contusions to the hands, arms or other body parts due to contact with sharp edges of glassware	**1d.** Evaluate condition of glassware prior to handling. ➢ Don Kevlar Level II Cut Resistant Gloves under nitrile-surgical gloves when handling broken glassware
2. Performing O&M	**2a**. Electrocution/ burns to hands/ skin resulting from contact with energized electrical equipment	**2a**. Follow required GES Lock Out/ Tag Out (LO/TO) procedure. ➢ Warn affected personnel of LOTO. ➢ Ensure all stored energy has been identified and reached “zero energy” state. ➢ Install locks/ tags on charging equipment (i.e. spring winding mechanism). ➢ Test equipment for isolation by attempting to start. Complete maintenance/repair. ➢ Don gloves that are electrically rated for task. Don safety boots with electrical safety rating that comply with GES requirements.

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

3. Unloading/loading carbon vessels from truck	**3a**. Back/body sprain/strain from lifting, moving or carrying equipment /materials "Butts Up", "Elbows Out", "Twist and Shout"	**3a.** Determine whether the item must be lifted - can it be left in place or pushed/pulled into place? ➢ Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist, rotate feet. ➢ When carrying, keep load close to the body keeping elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ➢ Use power tailgate lift to lower or to lift carbon units onto and off of truck. Use material handling devices (i.e., a hand truck) to prevent personal injury while moving carbon vessels. Make sure to secure the carbon vessel onto the hand truck using locking straps Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area.
4. Removing spent carbon units from residence and delivering replacement carbon units	**4a**. Back/body sprain/strain from lifting, moving or carrying units "Butts Up", "Elbows Out", "Twist and Shout" **4b**. Fractures/Contusions to torso as a result of being caught between or pinned by units **4c**. Cuts or contusions to the hands, arms or other body parts due to contact with sharp edges of units	**4a.** Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist, rotate feet. ➢ When carrying, keep load close to the body keeping elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ➢ Use material handling devices (i.e., a hand truck) to prevent personal injury while moving carbon vessels. **4b**. Use two people while maneuvering hand truck with secured carbon units up and down stairs with one person pulling the hand truck and the second positioned behind the hand truck for stability. ➢ Create an exclusion zone for all employees to stay out of. ➢ Make sure to secure the carbon vessel onto the hand truck using locking straps. **4c**. Inspect surface on units for burrs or sharp edges. ➢ Use enough force needed to complete the task and to prevent damage to tools or equipment. ➢ Don Kevlar Level II Cut Resistant Gloves.
5. Reconnecting carbon units	**5a**. Irritation or burns to eyes, hand, arms and other body parts that result from skin contact with system water	**5a** Do not turn on water until the system is connected and all fittings are secure. ➢ Minimize this condition by monitoring for released water and applying sand when ice develops ➢ Don nitrile gloves over Kevlar level 2 cut resistant gloves. ➢ Note: In cold environments, water released to the ground through leaks or splashing may freeze causing a dangerous slip hazard.
6. Replacing UV bulb	**6a**. Electrocution/ burns to hands/ skin resulting from contact with energized electrical equipment **6b**. Cuts or contusions to the hands, arms or other body parts due to contact broken glass	**6a**. Follow required GES Lock Out/ Tag Out (LO/TO) procedure. ➢ Ensure all stored energy has been identified and reached “zero energy” state. ➢ Unplug the UV Unit from the power supply (lock it out). ➢ Look for accumulated water on the floor and do not touch energized electrical equipment while standing in water. **6b**. Bulb sleeve is breakable. Two hands should be used at all times when handling this item. ➢ Wear cut resistant gloves (i.e., Kevlar under nitrile-surgical gloves) at all times when handling ➢ In case of broken glassware, try to use tools to clean up (broom, shovel, etc), instead of hands
7. Cleaning UV bulb sleeve	**7a**. Respiratory irritation/inflammation, headache, nausea, dizziness, acid burns to skin caused by exposure to cleaning solution	**7a**. This process uses muriatic acid to clean the sleeve. Comply with MSDS requirements for handling and use. ➢ Be sure to avoid contact with the skin and eyes by wearing safety glasses and Kevlar gloves under nitrile gloves while handling equipment. ➢ Work in a well-ventilated area (i.e., outdoors). N*ote: Keep water available while using acid. If contact is made with acid, flush the skin and eyes with large amounts of water and seek medical attention.*
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

Job Loss Analysis (JLA)

JLA Title: Potable Well Sampling

Date Developed: 3/3/2006	**Revised Date:** 1/5/2023
Initial Development Team: Tanner Stafford (Env Scientist)/ Alfonso Munoz (LHSO)	
Latest Revision by: Kara Gioulis, RHSSE Manager	
Quality Review by: Tom Baylis, CIH; VP HSSE	

Revision #: 012

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Air Purifying Respirator; ☐Ear Muffs; ☐Ear Plugs; ☐Face Shield; ☐Fire Retardant Clothing; ☐Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Goggles; ☐Hard Hat; ☐ Safety Glasses; ☐ Safety-toed Boots; ☐ Shirt (Highly-Visible Short/Long Sleeve); ☐ Tychem Suit; ☐Tyvek Suit; ☐Vest (Highly Visible Reflective Striped); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: Propane/ butane portable welding torch/ ABC-rated fire extinguisher

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Access potable well sample point	**1a.** Fractures/contusions to the arms, legs, torso...) from contact with third party individuals	**1a.** Evaluate neighborhood and well location and determine whether or not a two person sampling team is required. ➢ If a two person team is sent they must be in constant view of each other. ➢ Do not enter the sampling location if there are hostile acting person or persons issuing verbal threats ➢ Review GES site security plan and document in site specific HASP.
	1b. Lacerations/ punctures infections that could result from bite/ attack by wild or domestic animal	**1b.** Identify animals (i.e. dogs...) in the vicinity of the work area. ➢ Do not approach/ antagonize wild / domestic animals identified. ➢ Do not attempt to pet domestic animals and ensure all animals are secured before beginning work. ➢ Don long sleeve shirt and leather gloves to minimize potential for bites to skin.
	1c. Skin irritation/ anaphylactic shock that could result from bites or stings from poisonous insects.	**1c.** Spray wasp/ hornet nests with insect repellent from a distance recommended by the manufacturer. Determine size and location of nest as professionals may have to be consulted. ➢ Identify any wasp/hornet nests. ➢ Do not approach any wasp/ hornet nests identified. ➢ Visually inspect and carefully open any outside enclosures that insects and small animals could potentially enter. ➢ Don long sleeve shirt, long pants with socks pulled over legs to reduce the likelihood of ticks contacting the skin. ➢ Utilizing insect repellent with DEET is strongly recommended. ➢ Do not spray your skin directly. ➢ Perform daily tick check, If ticks are found on the skin remove per GES protocol, and upgrade skin protection
	1d. Hand/arm fractures or contusions as a result of tripping and falling when walking or working on uneven surfaces	**1d.** Inspect the work area and look for uneven areas that may create a tripping hazard. ➢ Plan walking path through work area to avoid the uneven areas ➢ If the path of travel is obstructed (lighting, over growth, clutter...) utilize a walking stick and probe ahead, walk slowly and use caution. ➢ Don safety boots with skid / puncture resistant soles that comply with GES requirements.
2. Collect water sample	**2a.** Burns / lacerations to hands, arms, body due to contact with portable propane/ butane during/ after sterilization of exterior spigot (sample point)	**2a.** Avoid contact with flame during sterilization of tap and hot tap surface after sterilization. ➢ Ensure that no flammable or combustible materials are nearby ➢ Open a hot work permit and ensure all permit conditions are met ➢ Have an ABC-rated fire extinguisher within 5 feet of tap being sterilized ➢ Wear safety glasses and leather work gloves during sterilization
	2b. Irritation to hand, arms and other body parts that result from skin contact with potentially contaminated water	**2b.** Avoid skin contact with sample water while collecting sample. ➢ Wear nitrile gloves to prevent skin contact with potentially contaminated water.
	2c. Irritation or burns to	**2c.** Do not splash purged water on clothing or skin.

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

	eyes, hand, arms and other body parts that result from skin contact with site contaminants and preservatives	➢ Sample preservative may have leaked from a container or multiple containers; sample preservatives consist of various types of acids that include HCL, HNO3, and H2SO4 – hand and skin protection is necessary ➢ If handling chemicals, review MSDS/SDS and understand signs/symptoms of exposure and first aid measures. ➢ Don PPE (i.e., eye protection, long pants, nitrile sampling gloves, hard hats, long sleeve shirts, steel-toed boots), evaluate the need to upgrade PPE to poly Face shield or goggles, chemical resistance suite (Tyvek/Tychem) if there is a potential for splashing of the chemical to occur.
	2d. Cuts or lacerations to hands from broken bottleware	**2d.** Inspect bottleware visually before handling ➢ Don cut-resistant gloves under nitrile gloves.
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

Job Loss Analysis (JLA)

JLA Title: Drilling/Soil Boring/Monitoring Well Installation

Date Developed: 2/23/2005	**Revised Date:** 1/4/2023
Initial Development Team: Bill Lovenberg, Driller/ Carl Farley, drillers helper	
Latest Revision by: Mark Lancaster, RHSM	
Quality Review by: T Baylis, CIH; VP, HSSE	

Revision #: 018

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Air Purifying Respirator; ☐Ear Muffs; ☐Ear Plugs; ☐Face Shield; ☐Fire Retardant Clothing; ☒Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Goggles; ☒Hard Hat; ☒Safety Glasses; ☒Safety-toed Boots; ☒Shirt (Highly-Visible Short/Long Sleeve); ☐Tychem Suit; ☐Tyvek Suit; ☒Vest (Highly Visible Reflective Striped); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: PID, GCI/O2 or LEL meter; Sample bottles/jars; Lockout/tag out kit; Spill response kit/spill pad - used under hydraulic equipment when work activities occur on a permeable surface such as grass or gravel

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Drill rig positioning at drilling location	**1a**. Fractures/ contusions due to contact with heavy equipment. (rig supports/ levelers) **1b**. Electrocution/shock due to contact with underground energized electrical lines.	**1a**. Make sure all operators are trained and qualified to operate the rig. ➢ All equipment should be inspected prior to use by the operator to ensure all safety devices are working as designed (i.e. back up alarms, kill switches, etc.) ➢ Never stand in equipment path ➢ All non-essential personnel must remain at least 20 feet away from the rig. ➢ Never assume operator can see you. Make eye contact with operator and have "show of hands" to ensure hands are off **1b**. Obtain up-to-date as-built plan to identify any subsurface utilities or obstructions. ➢ To the extent possible, LO/TO all sources of electricity in the vicinity of the all subsurface work. ➢ Locate all sources of electricity to site features. ➢ Notify all affected employees on-site of the de-energized condition. Comply with all LOTO procedures and permits
2. Drilling area containment construction	**2a**. Back sprain/strain from moving containment material	**2a**. Determine whether the item must be lifted - can it be left in place or pushed/pulled into place? ➢ Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist body, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ➢ Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area.
B. Drilling 1. Begin drilling soil boring/ monitor well	**1a**. Amputation/cuts to hand or fingers as a result of being caught in moving /rotating parts of drill rig **1b**. Back/body sprain/strain from moving augers / support equipment **1c**. Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to hazardous atmosphere. **1d**. Hearing loss caused by excessive noise during operation of drill rig	**1a**. Do not place hands/fingers near moving/rotating parts of drill rig ➢ All equipment must be inspected prior to use to ensure all safety shut down switches are working. ➢ Have all bystanders keep a minimum of 3 feet away from moving/rotating parts ➢ Do not wear excessively loose, baggy clothing, or jewelry. Ensure long hair is tied back. Don leather gloves ***Note:*** *When using an air rotary to drill the borehole ensure that the protective skirt is firmly secured to the drill rig in order to prevent sudden expulsions of potentially impacted groundwater/mud and soil (dust) from the open borehole* **1b**. Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist body, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ***Note*** *If the mark out locations are not visible (i.e. covered by snow, debris, vehicles, washed away/faded, etc.) stop work and contact the project manager or senior office manager* ***Note:*** *If any drums are filled with soil or any material, the drum can only be filled a maximum of two-thirds (2/3) full.* **1c**. Eliminate hazardous atmosphere by venting or degassing the area. ➢ Monitor work area with PID and comply with action levels document in HASP table 1. ➢ If hazardous atmosphere can't be eliminated with engineering controls, respirator upgrade may be necessary. ➢ Only those enrolled in a Medical Monitoring Program and with a current fit test (w/in past 12 months) may don a respirator. ➢ If respirator upgrade is required, contact PM, RHSSE before proceeding. **1d**.Create an exclusion zone around the work area so that third parties are not exposed to hazardous noise levels. Hearing protection should be worn if noise levels exceed 85 dBA as per this policy or if noise level is unknown (e.g., measurement device is not available or has not been pre-determined

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

	1e. Burns from a fire that occurs from faulty equipment or ignition of flammable vapors	➢ Don ear plugs and/or ear muffs. ➢ Double hearing protection (ear plugs and ear muffs) may be necessary if levels are found to be above 100 dBA. **1e**. Place one 20-lb fire extinguisher within 10' of the drilling location ➢ When welding steel casing together in borehole, the entire borehole is the hot work area. Options for managing are to erect a barrier to prevent sparks from travelling down borehole, perform stratified air monitoring down length of borehole before welding, inert borehole/add fresh ambient air to dilute any vapors present. ➢ Alternately, have driller bring threaded casing to site to eliminate the need for welding.
2. Collecting soil samples if necessary	**2a**. Irritation or burns to hand, arms and other body parts that result from skin contact with site contaminants **2b**. Fractures/ contusions due to contact with heavy equipment.	**2a**. Gather and pour sample slowly to minimize splashing onto skin/ clothing. ➢ Don long sleeve shirt, safety glasses, long pants and chemical resistant gloves. **2b**. Never stand in equipment path ➢ Never assume operator can see you. Make eye contact with operator and have "show of hands" to ensure hands are off ➢ All non-essential personnel must remain at least 20 feet away from the rig.
3. Auger removal and clearing soil ***Note: NO** J-hooks during auger removal*	**3a**. Cuts to hand or fingers as a result of being caught in moving/rotating parts of auger **3b**. Back/body sprain/strain from lifting or moving augers	**3a**. Use a garden trowel, paint spatula or other tool to remove soil from the auger. **Do not clear soil with your hands.** ➢ Don leather gloves, nitrile underneath if a liquid hazard is present. **3b**. Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in.-. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance.
4. Install well (riser, screen, sand pack, and bentonite)	**4a**. Back/body sprain/strain from lifting or moving bags of bentonite or other material **4b**. Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to dust **4c**. Cuts or contusions to the hands, arms or other body parts due to contact with sharp edges of cutting tools while cutting PVC well to finished length.	**4a** Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. **4b** Monitor dust levels in work area and wear nitrile gloves when cleaning up soil. ➢ Position yourself up wind from concrete dust generated while mixing. ➢ Don a dust mask if soil inhalation is unavoidable. **4c**. Ensure the cutting instrument(s) used are the approved tool for the job, you are trained on the safe usage and are equipped with "self-retracting" blades that CANNOT be overridden by the user (i.e. held out or locked open) or blades that are guarded and do not allow the blade to come in contact with the user. ➢ Make sure blades are sharp and all guards are in place before starting a cut. ➢ Inspect the cutting equipment prior to start of cut. ➢ Cut away from your body and keep hands out of the path of cutting tools. ➢ Have bystanders maintain a 3 foot distance from the cutting operation at all times. ➢ Don Kevlar Level II Cut Resistant Gloves. ***NOTE:** The use of utility and / or personal knives (i.e., Stanley knives, box cutters, pocket knives) is STRICTLY PROHIBITED.* ***Note**: Do not use a die grinder tool or similar device to cut casing. An internal plastic pipe cutter, or a tool that could not result in a hand injury is acceptable*
5. Pressure grout the steel casing (if open rock well) or PVC riser in place	**5a**. Back/body sprain/strain from lifting or moving material or piping **5b.** Respiratory irritation from exposure to grout	**5a**. Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. **5b**. Keep all staff who are not engaged in activities, a minimum of 10 feet from area. Keep grout wet and wear a dust mask to limit exposure
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

Job Loss Analysis (JLA)

JLA Title: Drum Removal (Mechanical) – Utilizing a Truck Mounted Lift Arm

Date Developed: 2/22/2005	**Revised Date:** 1/4/2023
Initial Development Team: Rich Brown, Tech Manager/ Mark Lancaster	
Latest Revision by: Kara Gioulis, RHSM	
Quality Review by: Mark Lancaster, RHSM	

Revision #: 010

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Air Purifying Respirator; ☐Ear Muffs; ☐Ear Plugs; ☐Face Shield; ☐Fire Retardant Clothing; ☒Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Goggles; ☐Hard Hat; ☒Safety Glasses; ☒Safety-toed Boots; ☒Shirt (Highly-Visible Short/Long Sleeve); ☐Tychem Suit; ☐Tyvek Suit; ☒Vest (Highly Visible Reflective Striped); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: Orange flags (direct vehicle traffic) and extra cones / flags (delineate area around lift arm)

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
A. Heavy Equipment 1. Inspecting of equipment (Lift Arm)	**1a.** Fractures /contusions to body due to contact with moving vehicles. **1b.** Cuts to hand or fingers as a result of being caught in moving/ rotating parts of lift arm equipment	**1a.** Utilize cones/barricades/safety fence to establish the work zone – Comply with GES Traffic Control program. ➢ Position work truck between work area and on-coming traffic. ➢ All staff not involved in the activity must remain 25 feet outside of work area ➢ Use "spotter" to warn personnel of approaching vehicles in high traffic areas. ➢ Don high visible sleeved shirt or outerwear, such as high visible traffic vests or clothing. **1b.** Keep all body parts (fingers / hands / arms...) are 2 feet away from any moving parts. ➢ Ensure lift arm and other equipment are inspected per manufacture requirements prior to begin drum lifting / removal. ➢ Inspect equipment for leaks and damaged components ➢ Ensure operator is trained and qualified to perform inspections. ➢ Don safety glasses, safety toe booths, hi-visible clothing and leather glove
B. Perform Loading Operations 1. Staging truck in area of drums	**1a.** Fractures /contusions to body due to contact with moving truck while moving to/from drum location.	**1a.** Never back up truck without a spotter ➢ If the need to redirect 3rd party traffic ensure traffic control plan is discussed and verify individuals (spotters) responsibilities. ➢ Spotters should not be within 15ft of truck during movement. ➢ Spotter and operator must remain in eye-contact and be aware of verbal / hand communications. ➢ Don hi-visible clothing.
2. Staging of drums and lift operations	**1a.** Back/body sprain/strain from lifting, moving or carrying drums to staging area (onto lift arm) **1b.** Cuts to hand or fingers as a result of being caught between lift arm and drums	**1a.** Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; don't twist. ➢ When carrying, keep load close to the body. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ➢ Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area. ➢ When handling any items/materials or equipment don leather gloves. **1b.** Operator will discuss with on-site staff areas of hazards and ensure no one places body parts in the identifed area (lift arm, between drums, bed of truck (staging area) etc. ➢ Do not place hands/fingers near any area between equipment (lift arm) and drums either during loading or unloading of drums. ➢ Do not wear excessively loose, baggy clothing, or jewelry. ➢ Don leather gloves.

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

3. Damage to overhead Utilities	**1a.** Electrocution/ shock due to contact with overhead energized electrical lines during lifting of drums.	**1a.** All over head utilities will be identified prior to operating lift arm. Notify / contact energized line utility to 1) de-energize lines & certify such, 2) move line(s) or 3) drape energized lines with insulating curtain. ➢ If voltage of overhead lines is < 50K maintain a minimum distance of 10ft between equipment and energized line(s). Add 4 inches to 10ft distance for increments of 10K in voltage. ➢ If voltage is unknown, maintain a minimum distance to energized line of 20 feet between equipment and energized line(s). ➢ Use "spotter" to observe equipment set up, ensuring no contact with overhead obstacles. ➢ All staff not performing the removal of drums will maintain a distance of 15ft, will not touch any equipment that may become energized (truck and lift arm), and will continue act as a spotter
4. Lifting / placing drums on to truck (elevated Loads)	**1a.** Fractures/ Contusions to head/torso as a result of being contacted by a falling drums	**1a.** Maintain a 15 foot distance from elevated drums and all associated moving equipment ➢ Do not walk under elevated drums; ensure drums are secure during movement; use a spotter when moving drums. ➢ Ensure designated spotter understands and complies with responsibilities (communication signals, location to stand...) ➢ No individual should be within 15ft of lift and no individual should ever attempt to guide drum during lift or stand in staging area of drum being moved (ground surface of truck bed). *Note: If any drums are filled with soil or any other material, the drum can only be filled to a maximum of two-thirds full*
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

Job Loss Analysis (JLA)

JSA Title: Vacuum Truck - General Use

Date Developed: 2/9/2005	**Revised Date:** 1/6/2023
Initial Development Team: Christophe Henry, PM / Ryan Sleeper, Geologist	
Latest Revision by: Basith Mohammed, RHSSEM	
Quality Review by: Tom Baylis, CIH; VP, HSSE	

Revision #: 011

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Air Purifying Respirator; ☐Ear Muffs; ☒Ear Plugs; ☐Face Shield; ☐Fire Retardant Clothing; ☒Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Goggles; ☐Hard Hat; ☒Safety Glasses; ☒Safety-toed Boots; ☒Shirt (Highly-Visible Short/Long Sleeve); ☐Tychem Suit; ☐Tyvek Suit; ☒Vest (Highly Visible Reflective Striped); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: PID and/or 4 gas meter

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
A. Locate Vacuum Rig (vac rig) to well and Open Onsite Wells 1. Inspect and open wells/replace well cap cover	**1a**. Fractures /contusions to body due to contact with moving vehicles. **1b.** Cuts or contusions to the hands, fingers or other body parts due to contact with sharp edges of well, well lid or well box **1c.** Cuts/punctures to knee from contact while kneeling on sharp objects on ground.	**1a**. Utilize cones/barricades/safety fence to establish the work zone – Comply with GES Traffic Control program. ➢ Position work vehicle between work area and on-coming traffic. ➢ Do not permit access to work zone by non-essential personnel. ➢ Inform facility personnel of work (restricted) area. ➢ All staff not involved in the activity must remain 25 feet outside of work area ➢ Use "spotter" to warn personnel of approaching vehicles in high traffic areas. ➢ Don high visible sleeved shirt or outerwear, such as high visible traffic vests or clothing. ➢ If working alongside an active roadway, where vehicular traffic is heavy, dawn/dusk hours, or if weather if overcast or rainy, high visible outwear with reflective stripping must be worn. **1b.** Remove manhole covers so that they do not pinch fingers. ➢ Keep body parts (hands, fingers) out from between the lid and well opening. ➢ Use a crowbar/pry bar to remove the lid or cap. ➢ Don cut resistant glove **1c.** Use kneeling pads when kneeling on hard surfaces.
2. Ground truck and bond lines and check exhaust location of vac rig	**2a**. Burns to hands/ arms or body due to fire that can result from the ignition of flammable vapors/ materials (static build-up) **2b**. Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to exhaust for vac rig or leaks from hoses/fittings	**2a**. Eliminate/control ignition sources (i.e. no smoking, no hot work in unapproved/untested areas) ➢ Monitor worker breathing zone/any enclosure prior to entry for flammable vapor concentrations using a LEL. ➢ Assure that truck is properly grounded and the grounding line is secure; avoid accidental disconnection. ➢ Bond lines to truck ground to avoid static discharge. ➢ DO NOT attempt to install a “grounding rod” unless Corporate HSSE has been contacted and the subsurface clearance protocol has been followed for both GES and the CLIENT. ➢ A proper "grounding rod" has to be made of a corrosion-free metal and needs to be installed a minimum of 8 feet into the ground. ***Note:*** *Refer to Vacuum Rig SOP for grounding instructions.* **2b**. Position the vac rig exhaust hose/stack so that is in a location where no building overhangs, there are no possible ignition sources, and building entrances cannot easily be filled with vapors. ➢ Eliminate hazardous atmosphere by venting or degassing the area. ➢ Monitor work area with PID and 4 – gas meter and comply with HASP action levels. Note: HASP action levels are based on benzene in gasoline; other contaminants will require different actions levels - consult HSSE/CHSSE for guidance. ➢ If hazardous atmosphere can't be eliminated with engineering controls, respirator upgrade may be necessary. □ Only those enrolled in a Medical Monitoring Program and with a current fit test (w/i past 12 months) may don a respirator. ➢ If respirator upgrade is required, contact office LHSO, Site Operations/Project Management before proceeding. ➢ Indoor operation of equipment fueled by hydrocarbon fuels requires emissions to be exhausted outside & carbon monoxide ***Note:*** *If a stack must be installed and placed overhead, then a minimum 20 foot clearance must be maintained from all overhead power lines. Other overhead lines such as telephone or cable, if there is a potential of contacting and/or damaging these lines, the appropriate service company should be contacted so that the lines can be protected or relocated* ➢ (CO) levels to be monitored.

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

		➢ CO levels over 35 ppm require operations to cease & staff to evacuate work area. ➢ Check all fittings and connections to ensure that gaskets are in place, seated properly, and in good condition
B. Apply Vacuum/Insert Pumps(s) to Monitoring Wells 1. Insert flex hose/drop tube into monitoring well	**1a**. Electrocution/shock due to contact with overhead energized electrical lines.	**1a**. Notify / contact energized line utility to 1) de-energize lines & certify such, 2) move line(s) or 3) drape energized lines with insulating curtain. ➢ If voltage is < 50K maintain a minimum distance of 10ft between equipment and energized line(s). Add 4 inches to 10ft distance for increments of 10K in voltage. ➢ If voltage is unknown, maintain a minimum distance to energized line of 20 feet between equipment and energized line(s). ➢ Use "spotter" to observe equipment set up, ensuring no contact with overhead obstacles.
2. Insert pneumatic pumps (i.e., submersible)	**2a**. Burns / lacerations to hands / arms or other body parts due to contact with components of air compressor **2b**. Back/body sprain/strain from lifting, removing pumps in well	**2a**. Ensure individuals using compressor is trained and comply with manufacture requirements for safe operating procedures. ➢ Keep hands and clothing 3 feet away from rotating machinery, inlet, and discharge openings. ➢ Always drain air compressor and lines using pressure relief valve before disconnecting air hoses, changing, cleaning, or dismantling pumps. ➢ Avoid contact with compressor casing and associated piping; may cause major skin burns on contact. ➢ Do not reach into any opening in the compressor while it is operating; ensure that any guards are in place on external moving parts. ➢ All hoses and fittings should be inspected prior to use. **2b**. If pumps are in a deep well and too heavy to pull manually, use mechanical means to pull (i.e., ratchet come along). ➢ Never pull on the air lines or electric lines connected to the pump. Use the pump rope or cable. ***Note:*** *Used for remediation of product and groundwater, or product transfer from product storage tanks or drums.*
3. Apply vacuum to monitoring well, above grade vessels, and open pits	**3a**. Hearing loss caused by excessive noise during operation of vacuum **3b**. Hand and arm contusions due to airline leaks / breaks under pressure. Note: pressurized air lines when broken can be an "injection" route of entry to body.	**3a**. Create a 20 foot exclusion zone around the work area so that third parties are not exposed to hazardous noise levels. ➢ Hearing protection should be worn if noise levels exceed 85 dBA or if noise level is unknown (e.g., measurement device is not available or has not been pre-determined) ➢ Don ear plugs and/or ear muffs. ➢ Double hearing protection (ear plugs and ear muffs) may be necessary if levels are found to be above 100 db. ***Note:*** *All personnel must know the location and operation of all emergency stop functions of the Vactron unit prior to beginning the use of this equipment.* **3b**. Ensure all air lines and couplings, utilize whip checks, are inspected for damage or wear before engaging equipment / tools. ➢ Ensure air lines are rated for specific pressure (PSI) when running. ➢ Ensure air lines meet manufactures requirements for specific use on equipment / tools (right line for right use). ➢ Keep all body parts, including face from any area where air lines are under pressure. ➢ Don Safety glasses, safety shoes, hi-visible clothing
4. Collection of vapor sample)	**4a**. Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to site contaminants	**4a**. Eliminate hazardous atmosphere by venting or degassing the area. ➢ Monitor work area with PID and comply with HASP action levels. Note: HASP action levels are based on benzene in gasoline; other contaminants will require different actions levels - consult HSSE/CHSSE for guidance. ➢ If hazardous atmosphere can't be eliminated with engineering controls, respirator upgrade may be necessary. Only those enrolled in a Medical Monitoring Program and with a current fit test (w/i past 12 months) may don a respirator. ➢ If respirator upgrade is required, contact office LHSO, Site Operations/Project Management before proceeding. ➢ Note: Connect vapor sampling assembly (inlet and outlet tubing, vacuum pump) to the vapor sampling collection port ➢ Withdraw vapor sample from vapor stream and collect in Tedlar bag via vacuum pump ➢ Secure Tedlar bag by closing the sample intake valve ➢ Preserve gas sample in chilled cooler for transport to analytical lab for analysis Secure vapor sampling collection port (lock and seal
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

Job Loss Analysis (JLA)

JLA Title: **Soil Sampling/Geoprobing**

JLA Control #: **030**

Date Developed: 2/7/05	**Revised Date:** 1/4/2023
Development Team: Carl Farley, Driller / Bill Lovenberg, Geoprobe Manager	
Revised by: Kara Gioulis, RHSSE Manager	
Approved by: Thomas Baylis, CIH, VP of HSSE	

Please complete the below if this JLA is being modified for SITE-SPECIFIC reasons.	
Revision #: 016	**Work Location:**
This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.	

REQUIRED PPE: Gloves: nitrile, Kevlar (Level II), leather. Hard Hat, Hearing Protection: if site activities raise the noise level to 85 dB. PPE Clothing: Long sleeve, highly visible shirt and coveralls can include reflective safety vest. Safety Glasses. Safety Shoes: steel-toed (ASTM F-2413).

REQUIRED AND/OR RECOMMENDED TOOLS AND EQUIPMENT: Lockout/tagout kit. Spill response kit/spill pad - used under hydraulic equipment when work activities occur on a permeable surface such as grass or gravel. GeoProbe cutting tool.

Activity/Sequence of Job Tasks	Hazards	Risk Control Measures
1. Setup Geoprobe and decontamination area for equipment	**1a**. Cuts or abrasions to hands, fingers or other body parts due to contact with equipment / tools **1b**. Burns due to contact with high-pressure water **1c**. Electric shock or burns due to contact with energized electrical lines	**1a**. Communicate or discuss location regarding tool placement and use during operations. Do not place hand tools on rig during operations. ➢ Ensure all body parts are out of the line of fire. **1b**. Set up decontamination area/pad away from others to avoid intrusion or splash hazards. ➢ Do not spray your face/body with water. ➢ If using a hot water pressure washer beware of high temperature water. **1c**. Locate all sources of electricity on site (i.e. site parking lights, air compressor, vacuum, car wash, ID sign, and load racks...) ➢ When possible and necessary (i.e. working w/i 10' of an energized line), initiate LOTO procedures, including GES / Client LOTO permitting requirements and notify all affected employees on-site of the de-energized condition. ➢ Alternately, ensure that the following clearances are maintained between equipment and energized overhead lines: o 10' for lines of 50kV or less o 10' plus 4" for every 10 kV over 50 o 20' for lines of unknown voltage
2. Open/cut concrete, asphalt, or soil at soil sampling location	**2a**. Eye injury, cuts to skin due to contact with flying debris	**2a**. Ensure individuals are properly trained in use of equipment (i.e. concrete saw, core drill, etc.). ➢ Inspect all equipment per manufacture guidelines (i.e. all safety features; kill switches and blade guards are used and positioned in accordance with manufacturer's requirements). Cut asphalt or concrete so that all particulate and debris is pushed or is directed away from the operator – be wind-aware and remain downwind whenever possible ➢ Comply with requirements indicated in the "Saw Cutting Tool Use" JLA #015 for more information.
3. Hand clear soil boring location	**3a**. Fractures/contusions to the body due to contact and release of stored energy from underground utilities etc. **3b**. Shoulder or back Sprain/strain due to hand clearing	**3a**. Hand clear slowly, do not force through soil; you may contact/break underground lines ("soft dig" technologies are strongly recommended). ➢ Ensure that the hand clearing creates a borehole clearance of at least 2 inches wider than the widest drilling tool. **3b**. When hand clearing, keep your feet shoulder width apart to improve stability and to avoid back, neck, shoulder, and wrist strain injuries. Do not twist at waist and take frequent breaks ➢ Take breaks based on depth and soil type (do not over exert).
4. Begin Geoprobing, soil boring	**4a**. Hand cuts due to contact with moving parts **4b**. Skin irritation from contact to contaminants when handling soil **4c**. Headache or dizziness from the inhalation of organic vapors in subsurface **4d**. Cut/abrasion to the skin due to contact with	**4a**. Ensure all site personal have been instructed on the location of moving parts and line of fire hazards. ➢ Ensure helpers are 3 feet from operations and non-essential personnel are 5 feet from operations (i.e., hammer, probe shaft). ➢ Ensure all equipment guards are in place per manufacture guidelines. **4b**. Ensure body parts are covered and no skin is exposed on hands, wrist or arms. Don PPE (long sleeve shirts, nitrile gloves over cut resistant gloves, safety glasses, hard hat and steel toe boots) when handling soil samples. **4c**. Consult and discuss HASP action levels and mitigation requirements with field crew. ➢ Monitor the air in the work area with a PID for elevated vapors during the probe activities. ➢ Discontinue activities if the PID reads >5 ppm sustained for 10 minutes. ➢ Consult SDS for signs / symptoms of potential vapor impacts. **4d**. Inspect rods prior to handling to ensure that no metal burs or other metal pieces extend from the rod that could cause a cut Wear leather gloves to prevent injury to the hand.

	equipment	➢ Don nitrile gloves to prevent contact with liquid hazards if present (gloves can be under or over leather gloves).
5. Add rods during probe/sampling activities	**5a**. Hand Injury due to contact with moving parts **5b**. Skin irritation from contact with contaminants when handling soil **5c**. Headache or dizziness from the inhalation of organic vapors which could impact body functions	**5a**. Ensure all site personal have been instructed on the location of moving parts and line of fire hazards. ➢ Ensure helpers are 3 feet from operations and non-essential personnel are 5 feet from operations (i.e., hammer, probe shaft). ➢ Ensure all equipment guards are in place per manufacture guidelines. If handling rods, wear leather gloves to prevent injury to the hand. ➢ Don nitrile gloves to prevent contact with liquid hazards if present (gloves can be under or over leather gloves **5b**. Ensure body parts are covered and no skin is exposed on hands, wrist or arms. Don PPE (long sleeve shirts, nitrile gloves over cut resistant gloves, safety glasses, hard hat and steel toe boots) when handling soil samples. **5c**. Consult and discuss HASP action levels and mitigation requirements. ➢ Monitor the air in the work area with a PID for elevated vapors during the probe activities. ➢ Discontinue activities if the PID reads >5 ppm sustained for 10 minutes. ➢ Consult MSDS for signs / symptoms of potential vapor impacts.
6. Collecting soil samples/ removal of acetate sleeve from direct-push sampler 	**6a**.Cuts and fractures to the hands, fingers, legs and other body parts due to tripping and falling over equipment or material **6b**. Cuts to the skin from broken glass or edges of cut acetate sleeve **6c**. Cuts to the skin from cutting acetate sleeve with cutting tool **6d**. Shoulder/muscular strain due to body positioning and excessive force while removing acetate sleeve	**6a**. Stay alert while logging soil samples for all drilling activities. ➢ Maintain your work area, keep walkways clean, tools picked up, and soil in drums should be placed out of walkways and traffic areas. **6b**. Inspect sample jars prior to handing to ensure that no cracks or other signs of breakage are present. Beware that cut edges of acetate sleeves are very sharp. ➢ Use a tool instead of your fingers and hands when handling broken glass, where practicable ➢ Don nitrile surgical gloves over top of cut resistant gloves when collecting soil from sleeves or discarding broken sample jars (trash bag, dumpster). **6c**. If an acetate sleeve needs to be cut, **DO NOT** use a fixed-blade or similar knife that does not comply with GES requirements **ONLY** a sleeve cutting tool shall be used (tool specifically design to cut acetate liners). ➢ Acetate liner shall be secured on table top or other means so as to eliminate the need to hold liner with hand during cutting activity. ➢ Cut away from your body and keep hands out of the path of cutting tools. ➢ Wear nitrile gloves over cut resistant gloves when using a cutting tool. **6d**. Do not force or over-exert during the removal of acetate sleeve. ➢ If the acetate sleeve can not be removed by normal means, then the truck deck extruder will be used or the direct-push sampling device will be taken back to the shop for removal of the sleeve after the soil sample is removed. ***Note:*** *Never attempt to remove the sleeve by using a pulling or jerking motion. This action could possibly cause a strain to occur. Also if a sleeve breaks off onto the end of the drive head, the drive head should be placed into a vice and needle nose pliers used to slowly remove the liner piece from the drive head. Alternately, a hydraulic sleeve removal tool is acceptable.* ***Note:*** *Only drilling subcontractors, who have the necessary training, are to perform cutting activities on an acetate liner.*
On-site edits:		

Job Loss Analysis (JLA)

JLA Title: Drilling/Soil Boring/Monitoring Well Installation

Date Developed: 2/23/2005	**Revised Date:** 1/4/2023
Initial Development Team: Bill Lovenberg, Driller/ Carl Farley, drillers helper	
Latest Revision by: Mark Lancaster, RHSM	
Quality Review by: T Baylis, CIH; VP, HSSE	

Revision #: 018

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Air Purifying Respirator; ☐Ear Muffs; ☐Ear Plugs; ☐Face Shield; ☐Fire Retardant Clothing; ☒Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Goggles; ☒Hard Hat; ☒Safety Glasses; ☒Safety-toed Boots; ☒Shirt (Highly-Visible Short/Long Sleeve); ☐Tychem Suit; ☐Tyvek Suit; ☒Vest (Highly Visible Reflective Striped); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: PID, GCI/O2 or LEL meter; Sample bottles/jars; Lockout/tag out kit; Spill response kit/spill pad - used under hydraulic equipment when work activities occur on a permeable surface such as grass or gravel

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
1. Drill rig positioning at drilling location	**1a**. Fractures/ contusions due to contact with heavy equipment. (rig supports/ levelers) **1b**. Electrocution/shock due to contact with underground energized electrical lines.	**1a**. Make sure all operators are trained and qualified to operate the rig. ➢ All equipment should be inspected prior to use by the operator to ensure all safety devices are working as designed (i.e. back up alarms, kill switches, etc.) ➢ Never stand in equipment path ➢ All non-essential personnel must remain at least 20 feet away from the rig. ➢ Never assume operator can see you. Make eye contact with operator and have "show of hands" to ensure hands are off **1b**. Obtain up-to-date as-built plan to identify any subsurface utilities or obstructions. ➢ To the extent possible, LO/TO all sources of electricity in the vicinity of the all subsurface work. ➢ Locate all sources of electricity to site features. ➢ Notify all affected employees on-site of the de-energized condition. Comply with all LOTO procedures and permits
2. Drilling area containment construction	**2a**. Back sprain/strain from moving containment material	**2a**. Determine whether the item must be lifted - can it be left in place or pushed/pulled into place? ➢ Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist body, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ➢ Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area.
B. Drilling 1. Begin drilling soil boring/ monitor well	**1a**. Amputation/cuts to hand or fingers as a result of being caught in moving /rotating parts of drill rig **1b**. Back/body sprain/strain from moving augers / support equipment **1c**. Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to hazardous atmosphere. **1d**. Hearing loss caused by excessive noise during operation of drill rig	**1a**. Do not place hands/fingers near moving/rotating parts of drill rig ➢ All equipment must be inspected prior to use to ensure all safety shut down switches are working. ➢ Have all bystanders keep a minimum of 3 feet away from moving/rotating parts ➢ Do not wear excessively loose, baggy clothing, or jewelry. Ensure long hair is tied back. Don leather gloves ***Note:*** *When using an air rotary to drill the borehole ensure that the protective skirt is firmly secured to the drill rig in order to prevent sudden expulsions of potentially impacted groundwater/mud and soil (dust) from the open borehole* **1b**. Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist body, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ***Note*** *If the mark out locations are not visible (i.e. covered by snow, debris, vehicles, washed away/faded, etc.) stop work and contact the project manager or senior office manager* ***Note:*** *If any drums are filled with soil or any material, the drum can only be filled a maximum of two-thirds (2/3) full.* **1c**. Eliminate hazardous atmosphere by venting or degassing the area. ➢ Monitor work area with PID and comply with action levels document in HASP table 1. ➢ If hazardous atmosphere can't be eliminated with engineering controls, respirator upgrade may be necessary. ➢ Only those enrolled in a Medical Monitoring Program and with a current fit test (w/in past 12 months) may don a respirator. ➢ If respirator upgrade is required, contact PM, RHSSE before proceeding. **1d**.Create an exclusion zone around the work area so that third parties are not exposed to hazardous noise levels. Hearing protection should be worn if noise levels exceed 85 dBA as per this policy or if noise level is unknown (e.g., measurement device is not available or has not been pre-determined

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

	1e. Burns from a fire that occurs from faulty equipment or ignition of flammable vapors	➢ Don ear plugs and/or ear muffs. ➢ Double hearing protection (ear plugs and ear muffs) may be necessary if levels are found to be above 100 dBA. **1e**. Place one 20-lb fire extinguisher within 10' of the drilling location ➢ When welding steel casing together in borehole, the entire borehole is the hot work area. Options for managing are to erect a barrier to prevent sparks from travelling down borehole, perform stratified air monitoring down length of borehole before welding, inert borehole/add fresh ambient air to dilute any vapors present. ➢ Alternately, have driller bring threaded casing to site to eliminate the need for welding.
2. Collecting soil samples if necessary	**2a**. Irritation or burns to hand, arms and other body parts that result from skin contact with site contaminants **2b**. Fractures/ contusions due to contact with heavy equipment.	**2a**. Gather and pour sample slowly to minimize splashing onto skin/ clothing. ➢ Don long sleeve shirt, safety glasses, long pants and chemical resistant gloves. **2b**. Never stand in equipment path ➢ Never assume operator can see you. Make eye contact with operator and have "show of hands" to ensure hands are off ➢ All non-essential personnel must remain at least 20 feet away from the rig.
3. Auger removal and clearing soil ***Note: NO** J-hooks during auger removal*	**3a**. Cuts to hand or fingers as a result of being caught in moving/rotating parts of auger **3b**. Back/body sprain/strain from lifting or moving augers	**3a**. Use a garden trowel, paint spatula or other tool to remove soil from the auger. **Do not clear soil with your hands.** ➢ Don leather gloves, nitrile underneath if a liquid hazard is present. **3b**. Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in.-. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance.
4. Install well (riser, screen, sand pack, and bentonite)	**4a**. Back/body sprain/strain from lifting or moving bags of bentonite or other material **4b**. Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to dust **4c**. Cuts or contusions to the hands, arms or other body parts due to contact with sharp edges of cutting tools while cutting PVC well to finished length.	**4a** Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. **4b** Monitor dust levels in work area and wear nitrile gloves when cleaning up soil. ➢ Position yourself up wind from concrete dust generated while mixing. ➢ Don a dust mask if soil inhalation is unavoidable. **4c**. Ensure the cutting instrument(s) used are the approved tool for the job, you are trained on the safe usage and are equipped with "self-retracting" blades that CANNOT be overridden by the user (i.e. held out or locked open) or blades that are guarded and do not allow the blade to come in contact with the user. ➢ Make sure blades are sharp and all guards are in place before starting a cut. ➢ Inspect the cutting equipment prior to start of cut. ➢ Cut away from your body and keep hands out of the path of cutting tools. ➢ Have bystanders maintain a 3 foot distance from the cutting operation at all times. ➢ Don Kevlar Level II Cut Resistant Gloves. ***NOTE:** The use of utility and / or personal knives (i.e., Stanley knives, box cutters, pocket knives) is STRICTLY PROHIBITED.* ***Note**: Do not use a die grinder tool or similar device to cut casing. An internal plastic pipe cutter, or a tool that could not result in a hand injury is acceptable*
5. Pressure grout the steel casing (if open rock well) or PVC riser in place	**5a**. Back/body sprain/strain from lifting or moving material or piping **5b.** Respiratory irritation from exposure to grout	**5a**. Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; do not twist, rotate feet. ➢ When carrying, keep load close to the body and at waist to shoulder height with elbows in. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. **5b**. Keep all staff who are not engaged in activities, a minimum of 10 feet from area. Keep grout wet and wear a dust mask to limit exposure
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

Job Loss Analysis (JLA)

JLA Title: Drilling/Deep Bedrock Drilling/Core Analysis

Date Developed: 3/17/2005	**Revised Date:** 1/4/2023
Initial Development Team: Karl Farley, driller/ Jake Wimberley, Assoc. Env. Sci.	
Latest Revision by: Kara Gioulis, RHSM	
Quality Review by: Tom Baylis, CIH VP, HSSE	

Revision #: 016

This JLA has been fully reviewed with all staff members and all activity job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on this JLA.

REQUIRED PPE: ☐Air Purifying Respirator; ☐Ear Muffs; ☒Ear Plugs; ☐Face Shield; ☐Fire Retardant Clothing; ☒Gloves (Chemical Resistant, Cut Resistant, Leather, Nitrile, Other); ☐Goggles;☒Hard Hat; ☒Safety Glasses; ☒Safety-toed Boots; ☒Shirt (Highly-Visible Short/Long Sleeve); ☐Tychem Suit; ☐Tyvek Suit; ☒Vest (Highly Visible Reflective Striped); ***Other:*** Enter other required PPE.

TASK-SPECIFIC TOOLS AND EQUIPMENT: PID/ CGI, extra traffic control supplies

Activity/Sequence of Job Tasks	Potential Hazards	Risk Control Measures
A. Bedrock Drilling 1. Mobilizing to location, beginning drilling	**1a**. Cuts to hand or fingers as a result of being caught in moving/rotating parts of drill rig **1b**. Back/body sprain/strain from lifting, moving or carrying equipment /materials **1c**. Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to hazardous atmosphere. **1d**. Lacerations to skin/ eyes that could result from contact with flying debris from drill rig **1e**. Hearing loss caused by excessive noise during operation of drill rig	**1a.** Do not place hands/fingers near moving/rotating parts of augers ➢ All equipment must be inspected prior to use to ensure all safety shut down switches are working. ➢ Have all bystanders keep a minimum of 3 feet away from moving/rotating parts ➢ Do not wear excessively loose, baggy clothing, or jewelry. Ensure long hair is tied back. ➢ Don leather gloves **1b**. Determine whether the item must be lifted - can it be left in place or pushed/pulled into place? ➢ Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; don't twist. ➢ When carrying, keep load close to the body. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ➢ Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area. **1c.** Eliminate hazardous atmosphere by venting or degassing the area. ➢ Monitor work area with PID and comply with action levels document in HASP table 1. ➢ If hazardous atmosphere can't be eliminated with engineering controls, respirator upgrade may be necessary. ➢ Only those enrolled in a Medical Monitoring Program and with a current fit test (w/in past 12 months) may don a respirator. ➢ If respirator upgrade is required, contact office LHSO, Site Operations/Project Management before proceeding. **1d**. Be aware of high pressure air and/or water near the drill head. Ensure all equipment is inspected and all safeguards are working and in place (E-Stop, guards...). ➢ Ensure all non-essential personnel are 15 feet from operation of equipment. ➢ Be alert for rock dust near the coring unit. ➢ Don safety glasses, may have to upgrade to face shield. **1e**. Hearing protection should be worn if noise levels exceed 85 dBA or if noise level is unknown (e.g., measurement device is not available or has not been pre-determined) ➢ Create an exclusion zone around the work area so that third parties are not exposed to hazardous noise levels. ➢ Don ear plugs and/or ear muffs. ➢ Double hearing protection (ear plugs and ear muffs) may be necessary if levels are found to be above 100 db.
2. Collecting bedrock cores (if necessary)	**2a**. Cuts or contusions to the hands, arms or other body parts due to contact with sharp edges on core **2b**. Cuts to hand or fingers as a result of being caught in moving/rotating parts of drill rig **2c**. Hand and arm fractures or contusions as a result of tripping and falling over equipment/debris remaining in work area	**2a**. Identify and (if possible) do not handling core that has sharp edges. ➢ Do not touch exposed surface of core unless you are wear gloves. ➢ Wear Kevlar™ cut-resistant gloves under nitrile gloves when handling core(s). **2b**. Do not place hands/fingers near moving/rotating parts of augers ➢ All equipment must be inspected prior to use to ensure all safety shut down switches are working. ➢ Have all bystanders keep a minimum of 3 feet away from moving/rotating parts ➢ Do not wear excessively loose, baggy clothing, or jewelry; Don leather gloves **2c**. Identify and remove any debris or non-essential equipment that is found in the work area to eliminate the tripping hazard. ➢ All tools, equipment of objects that may create a trip hazard must be placed in secured location or cleaned up and disposed of. ➢ Wear safety boots with skid / puncture resistant soles that comply with GES requirements.

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

3. Stem/ Core removal	**3a**. Cuts to hand or fingers as a result of being caught in moving/rotating parts of drill rig **3b**. Back/body sprain/strain from lifting, moving or carrying equipment /materials **3c**. Lacerations to skin/ eyes that could result from contact with flying debris from drill rig **3d**. Burns from a fire that occurs from faulty equipment or ignition of flammable vapors	**3a**. Do not place hands/fingers near moving/rotating parts of augers ➢ All equipment must be inspected prior to use to ensure all safety shut down switches are working. ➢ Have all bystanders keep a minimum of 3 feet away from moving/rotating parts ➢ Do not wear excessively loose, baggy clothing, or jewelry. ➢ Don leather gloves **3b**. Determine whether the item must be lifted - can it be left in place or pushed/pulled into place? ➢ Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; don't twist. ➢ When carrying, keep load close to the body. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ➢ Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area. **3c**. Be aware of high pressure air and/or water near the drill head. ➢ Ensure all equipment is inspected and all safeguards are working and in place (E-Stop, guards...). ➢ Ensure all non-essential personnel are 15 feet from operation of equipment. ➢ Be alert for rock dust near the coring unit. ➢ Don safety glasses, may have to upgrade to face shield. **3d**. Place one 20-lb fire extinguisher within 10' of the drilling location ➢ When welding steel casing together in borehole, the entire borehole is the hot work area. Options for managing are to erect a barrier to prevent sparks from travelling down borehole, perform stratified air monitoring down length of borehole before welding, inert borehole/add fresh ambient air to dilute any vapors present. ➢ Alternately, have driller bring threaded casing to site to eliminate the need for welding.
4. Core removal	**4a**. Back/body sprain/strain from lifting, moving or carrying cores **4b**. Hand and arm fractures or contusions as a result of tripping and falling over equipment/debris remaining in work area **4c**. Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to hydrocarbon vapor.	**4a**. Ensure path is level and clear of debris/obstacles. ➢ When lifting, bend at the knees; not the waist, keep back and torso straight; don't twist. ➢ When carrying, keep load close to the body. ➢ Items over 50 lbs. or large/awkward items require team lift or mechanical assistance. ➢ Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area. **4b**. Identify and remove any debris or non-essential equipment that is found in the work area to eliminate the tripping hazard. ➢ All tools, equipment of objects that may create a trip hazard must be placed in secured location or cleaned up and disposed of. ➢ Wear safety boots with skid / puncture resistant soles that comply with GES requirements. **4c**. Eliminate hazardous atmosphere by venting or degassing the area. ➢ Monitor work area with PID and comply with HASP action levels found in Table 1. ➢ If hazardous atmosphere can't be eliminated with engineering controls, respirator upgrade may be necessary. ➢ Only those enrolled in a Medical Monitoring Program and with a current fit test (w/i past 12 months) may don a respirator. ➢ If respirator upgrade is required, contact office LHSO, Site Operations/Project Management before proceeding.
C. Pressure Grouting 1. Grouting steel casing or PVC riser in place using a Tremie pipe	**1a**. Respiratory / skin irritation that could result from inhalation / contact with nuisance dust and grout.	**1a**. Avoid breathing grout dust by placing yourself upwind from the point where opening bags or mixing the grout is occurring. ➢ Avoid skin/ eye contact with grout by not getting closer than 5-feet to where grout is being mixed/ used. ➢ Use safety glasses or goggles to minimize eye-grout contact. ➢ Wear a half-face APR with HEPA filter if needed for comfort.
On-site edits:		

Hazard Categories: Exposure, Caught (in, under, between, by), Strain/Overexertion, Contact, Falls, Energy Sources

GES DAILY SITE SAFETY CHECKLIST

Site Name: _____
Address: _____

Task, Name, and date of entry: _____

This checklist is to be completed on a daily basis. The date should be noted in the space provided. The employee completing the checklist should verify that each item is correct and initial in the last space provided.

Date of field work:						
1. Proper training certificates have been obtained from all onsite personnel.						
2. The site-specific HASP has been reviewed and signed by GES employees and GES-hired subcontractors.						
3. The daily site-safety meeting has been conducted.						
4. Applicable JLAs are onsite, reviewed by staff to ensure all tasks/jobs are covered, and site specific JLA modifications occur when needed.						
5. Fire extinguishers are available for use and are fully charged.						
6. A fully-stocked first aid kit & eye wash bottle is readily available.						
7. Any potential tripping hazards have been removed from site.						
8. All vessels containing flammable or corrosive material are properly labeled.						
9. Proper personal protective equipment is being used for present conditions.						
10. Equipment onsite is checked and in safe working order.						
11. Safety cones and flags or barricades have been utilized to mark out work area along with all required signage (No Smoking, No Trespassing, Work Area...).						
12. No person onsite has the appearance of being under the influence of motor skill altering substances.						
13. All workers onsite are clothed in an appropriate manner (highly visible clothing, no tank tops, muscle shirts or shorts).						
14. Electrical power-operated tools shall be properly grounded and used with a Ground-Fault Circuit Interrupter (GFCI).						
15. All required permits (GES and/or client) are completed by an authorized individual.						
16. When working alone, has a phone call been placed to the PM to discuss site conditions, review the Scope of Work, LPS requirements, and coordinate communications for the day? Note: The frequency/ amount of additional calls from the field should be established during the PM's discussion with the individual. A call must always occur prior to leaving the site. **(FILL IN OFFICE COMMUNICATION TIME)**	TIME	TIME	TIME	TIME	TIME	TIME
17. Prior to leaving the site for the day, the GES site supervisor has conducted a meeting with onsite staff to review worker conditions (possible injuries), JLA revisions, discuss possible Near Losses/ Losses, and activities scheduled for the next day.						
18. All health and safety concerns have been communicated to the Regional HSSE Manager/Officer and Project Manager						
I verify and initial that the above information is correct by initialing in the boxes to the right:						

GES DAILY SITE SAFETY CHECKLIST

Site Name: _____
Address: _____

Task, Name, and date of entry: _____

This checklist is to be completed on a daily basis. The date should be noted in the space provided. The employee completing the checklist should verify that each item is correct and initial in the last space provided.

Date of field work:						
1. Proper training certificates have been obtained from all onsite personnel.						
2. The site-specific HASP has been reviewed and signed by GES employees and GES-hired subcontractors.						
3. The daily site-safety meeting has been conducted.						
4. Applicable JLAs are onsite, reviewed by staff to ensure all tasks/jobs are covered, and site specific JLA modifications occur when needed.						
5. Fire extinguishers are available for use and are fully charged.						
6. A fully-stocked first aid kit & eye wash bottle is readily available.						
7. Any potential tripping hazards have been removed from site.						
8. All vessels containing flammable or corrosive material are properly labeled.						
9. Proper personal protective equipment is being used for present conditions.						
10. Equipment onsite is checked and in safe working order.						
11. Safety cones and flags or barricades have been utilized to mark out work area along with all required signage (No Smoking, No Trespassing, Work Area...).						
12. No person onsite has the appearance of being under the influence of motor skill altering substances.						
13. All workers onsite are clothed in an appropriate manner (highly visible clothing, no tank tops, muscle shirts or shorts).						
14. Electrical power-operated tools shall be properly grounded and used with a Ground-Fault Circuit Interrupter (GFCI).						
15. All required permits (GES and/or client) are completed by an authorized individual.						
16. When working alone, has a phone call been placed to the PM to discuss site conditions, review the Scope of Work, LPS requirements, and coordinate communications for the day? Note: The frequency/ amount of additional calls from the field should be established during the PM's discussion with the individual. A call must always occur prior to leaving the site. **(FILL IN OFFICE COMMUNICATION TIME)**	TIME	TIME	TIME	TIME	TIME	TIME
17. Prior to leaving the site for the day, the GES site supervisor has conducted a meeting with onsite staff to review worker conditions (possible injuries), JLA revisions, discuss possible Near Losses/ Losses, and activities scheduled for the next day.						
18. All health and safety concerns have been communicated to the Regional HSSE Manager/Officer and Project Manager						
I verify and initial that the above information is correct by initialing in the boxes to the right:						

ATTACHMENT E

WORK PERMITS

ATTACHMENT F

PRE-ENTRY MEETING NOTES

PRE-ENTRY MEETING NOTES/ATTENDANCE

(Include date, length of meeting, names of personnel in attendance, topics of discussion, comments and concerns, etc.)

ATTACHMENT G

INJURY CASE MANAGEMENT FLOWCHART

GES PROJECT INJURY CASE MANAGEMENT

If an incident/injury occurs on-site to a GES or a subcontractor employee, the incident/injury must be immediately reported to the GES Onsite Supervisor. If a subcontractor is injured, also notify subcontractor management.

DOES THE INJURY REQUIRE EMERGENCY MEDICAL ATTENTION?

Yes

Response 1

1. *Call 911!!!!*
2. **Provide support/first aid to Injured Person (IP) until Emergency Management Services (EMS) arrives**
3. **GES onsite Supervisor notifies:**
   a) VP, HSSE Tom Baylis at **610 587-1124** *(Tom's backup is Basith at 954 304-7043)* **AND**
   b) GES Project Manager (PM) **or** GES Regional HSSE Officer/Manager (RHSSE). *(If IP is subcontractor, follow same approach and PM to notify sub management)*
4. **GES onsite Supervisor accompanies IP to emergency room (ER).** If IP was a lone worker, a member of management meets them at the site or the ER. *(If IP is subcontractor, subcontractor management meets them at ER)*
   a) Ensure that the IP receives the necessary support and medical care with guidance from VP HSSE
5. GES PM or GES RHSSE notifies GES Regional Operations Manager (ROM)
6. VP, HSSE (or backup) notifies GES Program Manager (PGM), COO, CEO
7. GES PGM or GES PM notifies Client
8. GES RHSSE generates report and initiates incident investigation
9. GES PM and RHSSE will initiate and complete any client required forms

Note: *VP, HSSE will notify third party injury support mgmt. company regarding IPs condition and to obtain injury case management support*

No

DOES THE INJURY REQUIRE TREATMENT?

No

Response 3

Report incident to GES PM and continue to monitor IP's condition

Yes

CAN THE INJURY BE TREATED WITH ONLY FIRST AID?

No

Response 4

Provide First Aid/ Support and THEN...

1. Provide Notifications per **Response 1, item 3**
2. At IP's request **or** per decision of VP, HSSE, IP will be scheduled for an evaluation at a GES contracted Occupational Clinic (OC) *(or subcontractor's chosen OC)*
3. Lead GES person accompanies IP to OC. If IP is alone, a member of management meets them at OC *(or subcontractor management meets them at OC)*
4. GES RHSSEM generates report and initiates incident investigation

Note: *VP, HSSE will notify third party injury support mgmt. company regarding IPs condition and to obtain injury case management support*

Yes

Response 2

Provide First Aid

GES staff certified in first aid will evaluate IP's condition and provide first aid/support

Then provide notifications per **Response 1, item 3**

Always Remember

It is extremely important to report incidents immediately to the GES onsite supervisor. Even if the injury is minor or if there is no initial injury and you feel it is not worth reporting, the incident must be managed and documented. Minor injuries may worsen over time.

Last Update: January, 2019

GES Health, Safety, Security & Environment (HSSE): An unwavering commitment to safeguard people, property, and the environment!

ATTACHMENT H

SIGN OFF SHEET

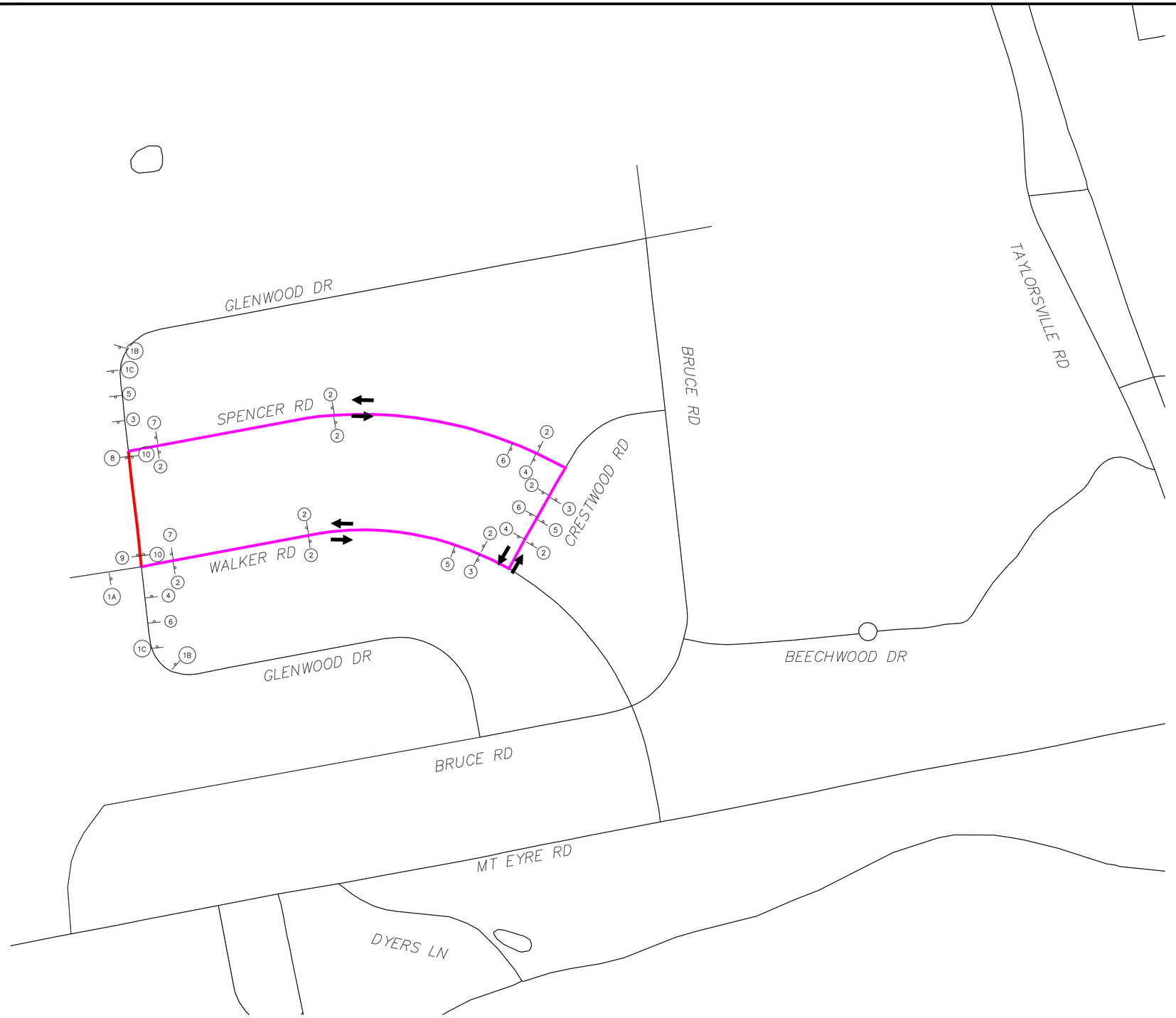
SITE SAFETY AND HEALTH PLAN COMPLIANCE AGREEMENT

All project personnel, including visitors, must follow the requirements of this Site Safety Plan. In order to document individual agreement with this requirement, all personnel must complete this "Site Safety and Health Plan Compliance Agreement." These agreements will be kept in this Site Safety Plan and will become part of the permanent project record upon completion of site activities.

By signing below, I have read the Site Health and Safety Plan (HASP), or I have been verbally advised of its contents. I understand, and I agree to comply with all of its provisions. I understand that I could be prohibited from working on the project, and I may be subject to disciplinary actions for violating any of the health and safety requirements specified in the HASP.

Name	Signature	Date	Time	LPS Card	OSHA Card

Attachment 10



TRAFFIC CONTROL PLAN
SCALE: 1"=200'

GRAPHIC SCALE
1"=200'
200' 0 200' 400'

LEGEND:

SYMBOL	DESCRIPTION
	ROAD CLOSURE
	DETOUR ROAD
1 3	TRAFFIC CONTROL SIGNS
	DETOUR DIRECTION ARROWS

MAINTENANCE AND PROTECTION OF TRAFFIC GENERAL NOTES

1. THIS WORK CONSISTS OF THE MAINTENANCE OF TRAFFIC AND THE PROTECTION OF THE TRAVELING PUBLIC APPROACHING THE CONSTRUCTION AREA AND WITHIN THE LIMITS OF CONSTRUCTION.
2. THE SAFETY FOR PEDESTRIANS WILL ALSO BE MAINTAINED AT ALL TIMES WITHIN THE LIMIT OF CONSTRUCTION AND APPROACHING THE CONSTRUCTION AREA.
3. FURNISH, ERECT, PLACE AND MAINTAIN TRAFFIC CONTROL SIGNS AND DEVICES. MAINTAIN TRAFFIC DURING HOURS OF CONSTRUCTION AND AT ALL OTHER TIMES CONSISTENT WITH THE METHODS INDICATED ON THESE DRAWINGS AND THE FOLLOWING:
   - PENNDOT PUBLICATION 35;
   - PENNDOT PUBLICATION 46;
   - PENNDOT PUBLICATION 72M;
   - PENNDOT PUBLICATION 111;
   - PENNDOT PUBLICATION 212;
   - PENNDOT PUBLICATION 213;
   - PENNDOT PUBLICATION 236;
   - PENNDOT PUBLICATION 408; AND
   - MUTCD, CURRENT EDITION
4. MAINTAIN ALL OFFICIAL EXISTING ROADWAY SIGNS.
5. REFER TO THE CONSTRUCTION REQUIREMENTS, CONSTRUCTION RESTRICTIONS, AND HOLIDAY RESTRICTIONS, WITHIN THE PROJECT CONTRACT, FOR ADDITIONAL INFORMATION PERTAINING TO THIS PROJECT.
6. SIGNS MAY BE SLIGHTLY ADJUSTED IN THE FIELD IN ORDER TO AVOID OBSTRUCTING DRIVEWAYS OR CLEAR SIGHT DISTANCES.
7. REMOVE THESE DEVICES IMMEDIATELY UPON COMPLETION OF THE WORK. PENNDOT WILL REMOVE ANY TRAFFIC CONTROL DEVICES ERECTED BY DEPARTMENT FORCES.
8. PERMITTEE MUST ARRANGE FOR INSPECTION OF ALL TRAFFIC CONTROL DEVICES PRIOR TO START OF WORK.
9. COVER OR REMOVE ALL CONFLICTING SIGNS AND ERADICATE ALL CONFLICTING PAVEMENT MARKINGS.
10. MOUNT ALL LONG-TERM ADVANCE WARNING SIGNS ON TYPE III BARRICADES UNLESS OTHERWISE NOTED OR INSTRUCTED BY DISTRICT OFFICE.
11. ALL SIGNS AND DEVICES TO BE MAINTAINED IN NEW OR LIKE NEW CONDITION.
12. DRIVEWAYS WILL BE KEPT ACCESSIBLE AT ALL TIMES. LOCATE ALL SIGNS SO THAT SIGHT DISTANCES WILL NOT BE OBSTRUCTED AT DRIVEWAYS AND LOCAL ROADS.
13. REMOVE ALL SHORT-TERM WORK ZONE TRAFFIC CONTROL SIGNING UPON COMPLETION OF THAT DAY'S WORK PERIOD. COVER OR REMOVE ALL SIGNS NOT IN USE.
14. ACCESS TO 121, 123, AND 124 GLENWOOD DR SHALL BE MAINTAINED AT ALL TIMES.

SPEED LIMITS:

GLENWOOD DR. 25 MPH
SPENCER RD 25 MPH
WALKER RD 25 MPH
CRESTWOOD RD. 25 MPH

NOTES/REFERENCE DRAWINGS

811 Know what's below. Call before you dig.

AED Energy Services Powered by ARG™

THE LOCATION OF THE PIPELINE FACILITIES AS SHOWN HEREON MUST BE CONSIDERED AS APPROXIMATE ONLY. BEFORE DIGGING OR FOR AN EXACT LOCATION PLEASE CONTACT YOUR STATES UNDERGROUND UTILITY LOCATION SERVICE.

AED ES PROJECT No.: AA0056

REV	DESCRIPTION	BY	DATE	CHK'D	APP'D

FACILITY CODE OR ACCOUNT NO:
CONSTRUCTION YEAR:

	BY	DATE
DRAWN	MBB	04/2025
CHECK	SPG	04/2025
APPROVED	SPG	04/2025

SCALE: AS NOTED

SUNOCO PIPELINE™ An ENERGY TRANSFER Partnership

UPPER MAKEFIELD TOWNSHIP
GLENWOOD DRIVE
TRAFFIC CONTROL PLAN

UPPER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

AFE NO.

OLD DRAWING NO.

DRAWING NO.

REV. NO. -

FILENAME: C:\Users\mbarry\Desktop\Important References\Projects\ET Glenwood Dr\CAD\DETOURPLAN.dwg PLOTTED: 4/11/2025 12:46:46 PM PLOTTED BY: ----

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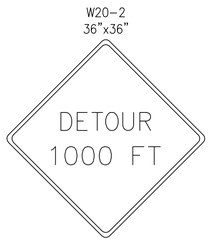

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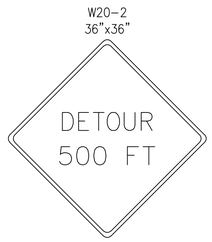

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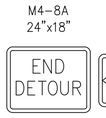

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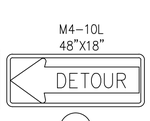

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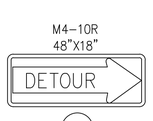


9

TYPE III BARRICADE
W/ ROAD CLOSED TO
THRU TRAFFIC
(R11-2)

10

PATA 215

1. At locations where there are overlapping detours or several detours within the same area, street names may be added to the DETOUR ARROW signs, or signs with different colored arrows may be used to designate different detour routes. The design and application of signs displaying color arrows shall comply with PennDOT Publication 236.

2. THIS STREET TO BE CLOSED FOR MAINTENANCE NEXT WEEK signs should be installed for scheduled work. Install the signs at most appropriate locations. PCMS may be used to post approved messages in lieu of static signs.

3. LEFT ADVANCE ARROW and RIGHT ADVANCE ARROW signs are required where the detour route has multiple lanes approaching intersections where turning movements are required. These signs are shown on each approach to display placement guidance.

4. TTC signs shall not be attached to permanent sign posts or utility poles without the utility pole owner's permission.

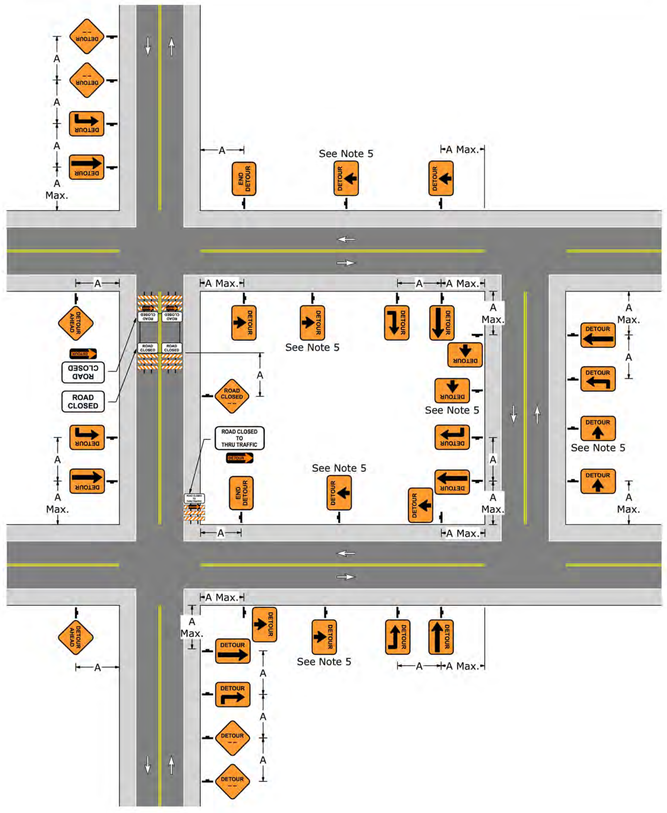
5. Install confirmation STRAIGHT THRU ARROW signs at one-mile intervals or after major intersections.

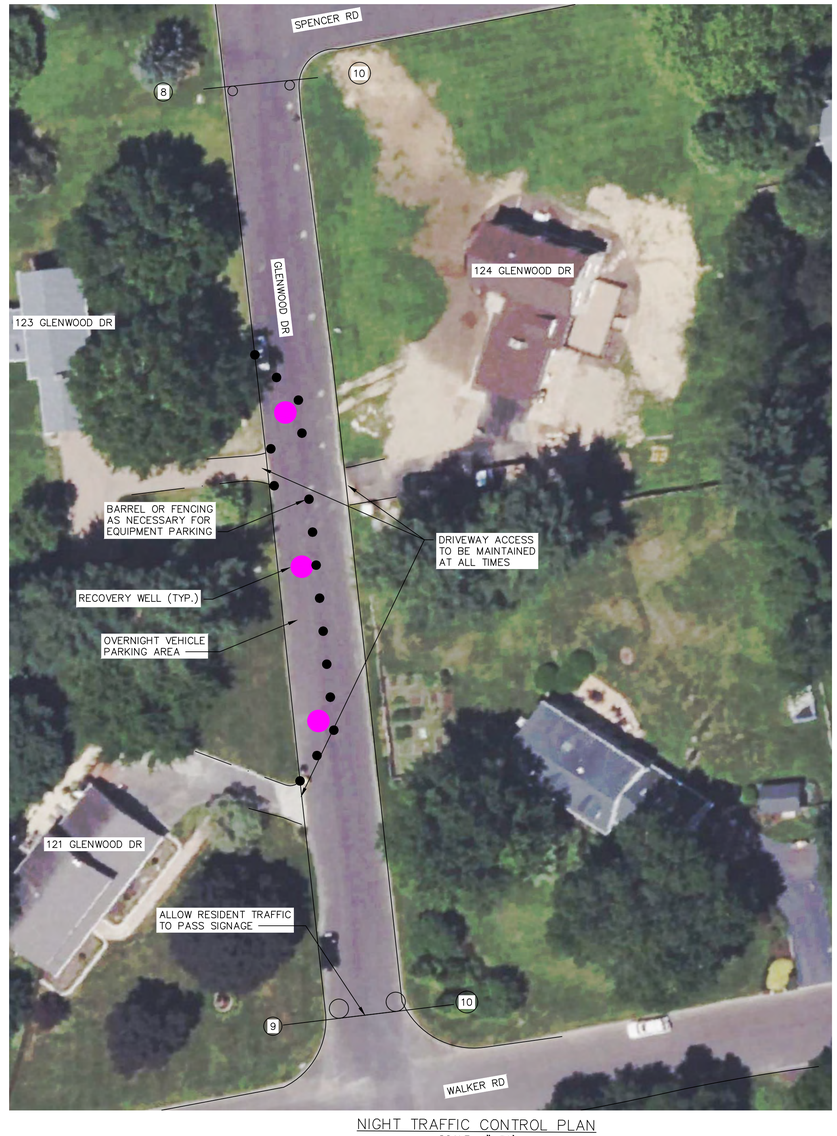
Signs

W20-2	W20-3	W23-101	M4-9S	M4-9L	M4-9R	M4-9SL	M4-9SR	M4-8A
M4-10L	M4-10R	R11-2	R11-4					

Sign Spacing		
Speed	Sign Spacing	
	Urban	Rural
S (MPH)	A (Feet)	A (Feet)
25	100 - 200	500 - 800
30	100 - 200	500 - 800
35	100 - 200	500 - 800
40	350 - 500	500 - 800
45	350 - 500	500 - 800
50	350 - 500	500 - 800
55	350 - 500	500 - 800

PATA 215





NIGHT TRAFFIC CONTROL PLAN
SCALE: 1"=30'

GRAPHIC SCALE
1"=30'
30' 0 30' 60'

NOTES/REFERENCE DRAWINGS

811 Know what's below. Call before you dig.

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AED ES PROJECT No.: AA0056

REV	DESCRIPTION	BY	DATE	CHK'D	APP'D

FACILITY CODE OR ACCOUNT NO:
CONSTRUCTION YEAR:

	BY	DATE
DRAWN	MBB	04/2025
CHECK	SPG	04/2025
APPROVED	SPG	04/2025

SCALE: AS NOTED

SUNOCO PIPELINE™ An ENERGY TRANSFER Partnership

UPPER MAKEFIELD TOWNSHIP
GLENWOOD DRIVE
TRAFFIC CONTROL PLAN & DETAILS

UPPER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

AFE NO.
OLD DRAWING NO.
DRAWING NO.
REV. NO. -

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