61 EDSON STREET LLC

REMEDIAL SYSTEM OPTIMIZATION WORK PLAN
WARD PRODUCTS SITE
61 EDSON STREET, AMSTERDAM, NY

DEC Site No. 429004

8 April 2024 REVISED 8 May 2024

Prepared for:

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JEM Project No.240102

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CERTIFICATION

I Matthew R. Napierala, P.E. certify that I am currently a NYS registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

4 April 2024

1.0 INTRODUCTION

This document constitutes the Remedial System Optimization Work Plan (RSOWP) for the Ward Products Site. The Ward Products Site located at 61 Edson Street in Amsterdam, Montgomery County, NY (the Site) is a NYS Inactive Hazardous waste Site (No. 429004), subject to the terms of a Record of Decision (ROD) issued by New York State Department of Environmental Conservation (NYSDEC) dated March 2007. The Site is a 'Class 4' Inactive Hazardous Waste Site, meaning remediation is complete but ongoing actions are required. One of those ongoing actions is extraction and treatment of groundwater containing concentrations of Chlorinated Volatile Organic Compounds (CVOCs) that exceed New York State Groundwater Standards (NYSGWS), of which Trichloroethene (TCE) has been detected most often and at the highest concentrations. To control the migration of groundwater containing CVOCs at concentrations exceeding NYSGWS, a Groundwater Extraction & Treatment System (GWE&TS) was installed in 2009. The GWE&TS has had several modifications; currently groundwater is extracted from bedrock via two recovery wells and treated at an on-site air stripper, with treated water being discharged to the City of Amsterdam Wastewater Treatment Facility.

The previously-referenced ROD and associated Site Management Plan (SMP) dated February 2011 (as amended in July 2011 and January 2017) and Environmental Easement (EE) require other actions at the Site, including maintaining the EE, maintaining a soil cover system and off-site sedimentation basins, and operation and maintenance of a sub-slab depressurization system (SSDS) in the on-site building. Those SMP requirements will continue to be met. However, this RSOWP addresses only the remediation of groundwater at the Site, including groundwater monitoring.

This RSOWP provides details on how the selected remedial system optimization approach will be implemented. A RSO Spill Prevention and Response Plan is provided as Appendix B and a Health and Safety Plan (HASP) is provided as Appendix C (**note-** ground disturbance is not planned, so Community Air Monitoring is not required).

2.0 SITE BACKGROUND AND SETTING

2.1 SITE LOCATION

The Site is located within the City of Amsterdam, Montgomery County, New York (Figure 1) and is identified as parcel 56.10-2-34 on the Montgomery County Tax Map. The Site is an 8.6-acre parcel within the Edson Street Industrial Park located on the southeast side of the City of Amsterdam (approximately 1.25 miles east of 'downtown' Amsterdam). The Site is located approximately 3,300 feet northeast of the Mohawk River and includes an approximately 69,500-square-foot single story building, lawn areas, a paved parking lot and an undeveloped portion north of the Site building. A drainage ditch on the eastern side of the property directs surface water flow to the southwest towards Edson Street, which continues downstream of the Site towards the Mohawk River.

2.2 SURROUNDING PROPERTY USAGE

The Site is bounded by various retail and manufacturing businesses including Saratoga Horseworks (west), FGI Fibers, Inc. (east), Bush Products, Inc. and Town & Country Bridge & Rail (south, across Edson Street). The northern side of the Site is bounded by vacant land.

2.3 PHYSICAL SETTING

2.3.1 Geology/Hydrogeology

Soil at the Site consists of glacial till overlying Chuctanunda Creek dolostone bedrock. The till layer is generally two to four feet thick near the north end of the Site building but increases to over 50 feet in thickness to the south. Previous investigations at the Site have found very little groundwater in the glacial till. As such, the primary water-bearing zone beneath the Site is in the fractures, joints and bedding planes of the shallow bedrock. Groundwater flow is generally toward the west-southwest and south.

2.3.2 Surface Water and Wetlands

Surface water on paved portions of the Site discharge to a series of on-site storm drains. Roof drains are connected to below-grade pipes that enter the storm drain system. Surface water on the eastern, unpaved area of the Site is directed towards Edson Street via a drainage swale. Wetlands are not present on the Site.

2.4 SITE HISTORY

The Site building was initially constructed in 1957 and expanded thereafter, and was first occupied by the Gabriel Corporation, which manufactured car antennas. Ward Products, subsequently New Water Realty Corporation (NWR), purchased Gabriel's operation and the Site in 1959. As part of the manufacturing process, small metal parts were cleaned with solvents using vapor degreasing prior to plating, resulting in releases as summarized below.

Between 1957 and 1973, untreated electroplating bath solutions containing chromium, zinc, cadmium, and nickel, and the degreasing solvent TCE were reportedly discharged to the nearby drainage ditch east of the Ward Products building. From 1973 through 1985, operations pretreated the plating solutions from the nickel/chromium line and dried the resulting sludge on an outdoor concrete pad prior to removal for off-site disposal. The spent cadmium/cyanide plating solution was discharged to an outdoor tank for both natural and mechanical evaporation and off-site disposal of the remaining sludges. The zinc/cyanide line was discontinued in 1973. Soil from the former sludge drying pad area was significantly excavated during the building expansion, stockpiled, and then removed from the Site during subsequent Interim Remedial Measures (IRMs).

Ward Products connected to Amsterdam's sewer system in 1983 and then discontinued the vapor degreasing system. All electroplating operations at the Site were discontinued in 1985. In 1988 and 1989, the plant expanded with a new grinding shop built over the former sludge drying pad and a new warehouse area built to the north. The expansion of

the manufacturing building over this area eliminated some of the contaminant mass and reduced the potential for migration of, or exposure to, remaining residuals.

As a result of the releases and remaining residuals in soil and groundwater, NYSDEC listed the Site as a Class 2a site in the Registry in 1985. Subsequent investigations and remediations addressed contamination at the Site, resulting in its current status as a Class 4 Hazardous Waste Site. In 2019, the Site was purchased by the current owner, 61 Edson Street, LLC.

2.5 SUMMARY OF PREVIOUS INVESTIGATION AND REMEDIATION

2.5.1 Summary of Previous Investigation and 2022 Remedial Investigation

Hydrogeologic investigations were performed at the Site in 1986 and 1988. The 1988 investigation included test pitting in the areas east and southeast of the former electroplating and treatment operations. Surface water and sediment samples were collected from the drainage ditch. Shallow soil samples were also collected from beneath the sludge drying pad. NYSDEC subsequently listed the Site as a Class 2 site in 1989 due to the presence of hazardous waste considered to be a significant threat to the public health or the environment. A Remedial Investigation (RI) was conducted at the Site during the period between August 1997 and May 2005. RI results were used to establish the ROD and develop the remedial action plan summarized below.

Excavation of affected exterior soil and sediment (both on-site and off-site) has been completed as required by the ROD. Remediation activities are described in the FER dated 17 January 2012 prepared by AECOM, and are summarized as follows:

- In 1997, 30 cubic yards of contaminated soil containing metals, which had been stockpiled during the plant expansion of 1988-89, were removed from the Site;
- In 1999, 15 cubic yards of soil containing PCBs and metals were excavated from next to the Ward Products building in the vicinity of the fenced-in transformers;
- In 2000, 27 tons of sediment inside and soil surrounding a sewer outfall pipe which contained metals and VOCs were removed and the pipe was repaired;
- In 2004, 700 tons of contaminated soil (metals) around the Ward Products building and 350 tons of contaminated sediments (metals) from the on-site and off-site

drainage ditch were removed and residual contamination was covered with stone or a clean soil cap;
- In 2005, a sub-slab depressurization system was installed beneath the eastern portion of the on-site building to create a negative pressure gradient below the building slab, minimizing infiltration of VOC vapors into the building;
- Between December 2008 to February 2009, a total of 3,475 tons of impacted sediments were removed from the drainageways downgradient from the Site;
- The GWE&TS was placed into service in 2009; also, two rounds of In-situ Chemical Oxidation (ISCO) injections were performed (one in 2009, one in 2010) as a pilot test to determine if ISCO would effectively treat contaminated groundwater.

A Final Engineering Report (FER) was submitted in January 2012. A Certificate of Completion was issued by NYSDEC in March 2012.

2.5.2 Groundwater Analytical Results and Comparison to SCGs

Groundwater sample collection and analyses occurred most recently in August 2023 (see Appendix A). Groundwater analytical results were compared to NYSDEC Groundwater Standards presented in NYSDEC Technical and Operation Guidance Series (TOGS) 1.1.1 dated June 1998 including the most recent updates. The results are summarized as follows.

VOCs

At least one groundwater sample contained one or more of the following CVOCs at concentrations exceeding NYSGWS: trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2 dichloroethene (cis-1,2 DCE) and vinyl chloride (VC) as follows (data tables are provided in Appendix A):

- TCE was detected in ten samples at concentrations exceeding NYSGWS, the highest concentration (30,000 ug/L) was detected in the sample from MW-4R;
- PCE was detected at a concentration exceeding NYSGWS only in the sample from MW-4R, at a concentration of 2,300 ug/L;
- cis-1,2 DCE was detected in six samples at concentrations exceeding NYSGWS, the highest concentration (64 ug/L) was detected in the sample from MW-4;
- VC was detected at a concentration exceeding NYSGWS only in the sample from MW-4, at a concentration of 2.9 ug/L.

Chromium

Six groundwater samples were also analyzed for total chromium in August 2023. Chromium was detected at a concentration exceeding NYSGWS only in the sample from MW-1R at a concentration of 340J ug/L (J indicates an estimated value).

Please note that, per the NYSDEC-approved sampling plan, the following wells were sampled in 2022 but not in 2023: MW-14, MW-18, MW-19, and MW-20. Analyses of the 2022 samples did not detect CVOCs in the samples from any of those wells.

2.5.3 Summary of Current Site Conditions

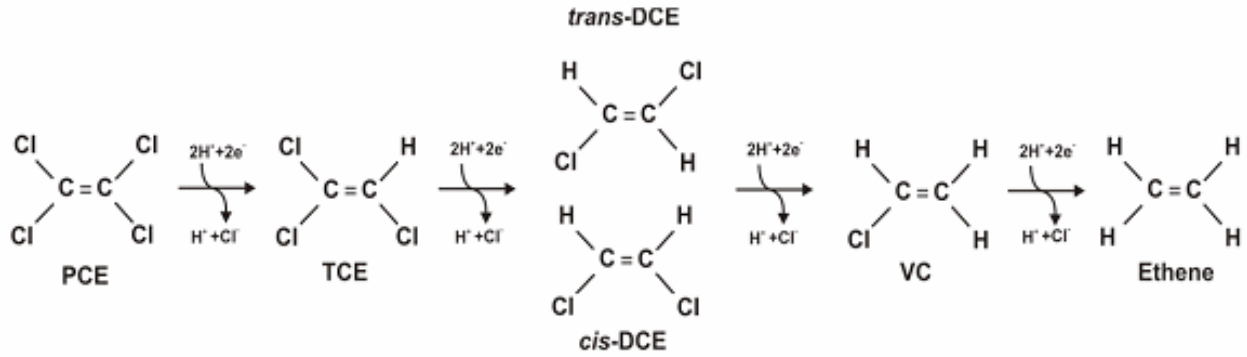
The GWE&TS is currently operating using two bedrock extraction wells. The most recent groundwater level measurements indicate that pumping is controlling off-site migration of affected groundwater. A total of 15,250 gallons of water was extracted and treated between February 27 and March 27, 2024 (an estimated average of about 500 gallons/day). Annual groundwater sampling was conducted by the consulting firm LaBella in August 2023. The resulting report stated that "the highest concentrations of VOCs identified in groundwater are identified in bedrock well MW-4R. This well is located on the eastern side of the commercial building on the Site. Other monitoring wells exhibiting dissolved total VOC concentrations in excess of 100 ug/L are monitoring wells MW-6 (459 ug/L) and MW-7 (133 ug/L), both located in the area east of the commercial building and, well MW-10 (408 ug/L) located in the area south of the commercial building." Please note that the TCE concentration in the sample collected from monitoring well MW-4R in August 2023 was 30,000 ug/L.

All other requirements of the SMP are being met.

3.0 REMEDIAL SYSTEM OPTIMIZATION APPROACH

The RSO will consist of In-Situ Chemical Reduction (ISCR), which is the in-place abiotic transformation of contaminants by chemical reductants. Contaminants treated by ISCR include chlorinated compounds (e.g., chlorinated solvents such as trichloroethene), metals in a high oxidation state (e.g., hexavalent chromium or Cr^{6+}), and oxidized inorganics (e.g., perchlorate). Hybrid amendments that combine zero-valent iron (ZVI) emulsified in a carbon substrate are frequently used to treat chlorinated compounds, which create strong reducing conditions to drive chemical reduction while also supporting reductive dechlorination. ISCR is appropriate for the 61 Edson Site due to the existing anerobic condition in the groundwater system.

Enhanced Reductive Dechlorination (ERD), and ISCR approach, proceeds as chlorine atoms attached to an organic compound are sequentially removed under anoxic (no oxygen) conditions. Biostimulation introduces an electron donor (carbon source) into the aquifer for stimulating microbial growth, modifying the existing geochemical and biological conditions in an aquifer to facilitate degradation of contaminants. The carbon source is used as food by native microbes, which in turn produce hydrogen through fermentation. This process depletes the aquifer of dissolved oxygen (DO) and other electron accepters including nitrate, sulfate, and ferric iron, which lowers the oxidation-reduction potential (ORP), thereby creating the conditions for reductive dechlorination to occur (reference: https://frtr.gov/matrix/Enhanced-In-Situ-Reductive-Dechlorinated-for-Groundwater/). The dechlorination process is presented below.



JEM plans to contract the licensed remediation contractor Innovative Environmental Technologies (IET) to remediate on-site groundwater affected with CVOCs including TCE and PCE by using ERD in an anerobic environment. The approach injects a patented product consisting primarily of emulsified vegetable oil, water, duel-valent iron (DVI), surfactants and methane inhibitors to release hydrogen allowing naturally-occurring organisms to replace the chlorine in the CVOCs with hydrogen. CVOCs accept hydrogen and expel chlorine, resulting in degradation of the CVOC to form vinyl chloride and eventually ethene. The process also forms methane, which competes for hydrogen; therefore, a methane inhibitor will be used.

Provect-ERD-CH4, which contains proprietary fermentable carbon sources plus water-soluble DVI and Antimethanogenic Reagent (AMR) technology (i.e. methane inhibitor), will be the amendment used at the 61 Edson Site. This amendment is manufactured and shipped as a prepared mixture that contains 60 - 85% fermentable carbon (FC) along with the following:

- Provect-CH4® AMR;
- Glycerin as fast-release H donors;
- Soluble lactic acid as mid-release H donors;
- Ethyl lactate as a green solvent and H donor;
- Dissolved fatty acids as long-term release H donors;
- Soluble organic Fe content 5 to 20% weight basis
- pH buffers.

Product information is provided as Appendix C.

4.0 REMEDIAL SYSTEM OPTIMIZATION PROCESS

The introduction of the ERD amendment would generally follow this approach.

1. Turn off the GWE&T system and remove the pumps and associated piping and wiring to allow hydrologic conditions to stabilize*. Pumps and associated materials will be maintained on-site in case re-installation is needed.
2. Evaluate the stormwater system in the treatment area and other potential sources of surface water infiltration to avoid introduction of clean water and oxygen. For example, there are several storm drains, manholes and chambers in the injection area (see photographs below). All such features will be inspected, cleaned and evaluated to determine if repairs are needed to minimize infiltration into the subsurface in the area to be treated.
3. Measure water table 'rebound' to determine length of time needed to equilibrate hydrogeologic conditions. Water level readings will be collected from the following wells over the course of one day or until water level equilibrate (whichever occurs first): MW-1, MW-1R, MW-2, MW-3, MW-4, MW-4R, MW-6, MW-7, MW-8, MW-9, MW-10, IW-02, IW-03, IW-04, RW-1, and RW-2.
4. Once static conditions are established, collect groundwater samples from the monitoring wells listed below and analyze for CVOCs, ORP, DO, pH, conductivity, sulfate, and other indicator parameters (e.g. Total Organic Carbon, volatile fatty acids, methane, ethane, ethene): MW-1R, MW-3, MW-4R, MW-6, MW-7, MW-8, MW-9, and MW-10.
5. Evaluate wells IW-02, IW-03, IW-04, RW-1 and RW-2 for competence and usefulness as injection wells by checking depth to water and total well depth and inspecting the well (including casing and curb box) for damage; wells will be repaired and/or modified as needed to allow for use as injection wells.
6. Obtain USEPA injection permit.
7. Utilize existing injection wells and recovery wells to inject (under slight pressure) an estimated 3,000 gallons of ERD stimulant into the water-bearing bedrock fractures.
8. Collect groundwater samples from selected wells and analyze for CVOCs, ORP, DO, pH, conductivity, sulfate, other indicator parameters at 45-90-120 days.

[*Allowing the water table to rise to static elevation will expose more water-bearing zones to treatment.]

A total of 24,300 pounds of treatment amendment will be introduced as follows:

- IW-02, IW-03, IW-04 will each receive 4,500 pounds;
- RW-1 will receive 9,000 pounds, and
- RW-2 will receive 1,800 pounds.

These wells were selected because they are located in the area of highest CVOC concentrations in groundwater. Well locations are shown on attached Figure 3; construction details for the wells to be used for injection are as follows:

Well No.	Depth to Bedrock* (ft)	Total Depth (ft)	Open hole or screened	Screened Interval*	Well Diameter (in.)	sand pack, etc.?
IW-02	13.5	80.8	screened	20-80	2	no
IW-03	11	80.8	screened	20-80	2	no
IW-04	13	80.8	screened	20-80	2	no
RW-01	14	80	screened	20-80	6	yes
RW-02	*	50	4" diam.sc.	30-50	6	no

The following sequence will be followed when injecting at all injection well locations.

1. Subsurface Pathway Development. Initially, nitrogen gas will be delivered to the subsurface via IET's proprietary injection trailer system. Nitrogen gas will be used so that oxygen is not introduced into an environment targeted for anaerobic processes. The gas is introduced at approximately 150 psi for two to three seconds such that delivery pathways and voids are established. Pathway development shall be verified by observing a pressure drop.

2. ISCR Slurry Injection. A slurry of the prescribed amendments will be immediately injected into the subsurface zones. Predetermined masses and concentrations of the amendments will be applied during this step. Slurries will be created by mixing ERD-CH4 with potable water to achieve the desired concentration. Flow rates will be estimated prior to injection and will be adjusted in the field as needed to avoid 'daylighting' and to maximize efficiency.

3. Follow-up Gas Injection. After injection of amendment is completed, the injection lines are cleared of liquids and all injectants are forced into the target formation with compressed nitrogen. Once the injection cycle is complete, the injection point is capped to allow for the pressurized subsurface to accept the injectants. The targeted saturated zone at the Site will receive calculated dosages of the individual remedial components based on biological and stoichiometric demands and an estimated pore volume based on the known geology of the Site.

Injections will be observed at all times to monitor for 'daylighting' and other potential issues. If daylighting is identified, the injection of the solution will be halted and the procedures will be re-evaluated and adjusted, as necessary, to limit further daylighting.

Once injection of the prescribed dosage of amendment is completed, all equipment will be removed from the Site and wells will be closed.

All measurements, calculations, activities and outcomes will be recorded in detail in logbooks as describe in Section 8.0.

5.0 REMEDIATION EQUIPMENT

IET's will utilize a full-equipped mobile injection trailer to accomplish the introduction of amendment. Equipment is described below, with images provided as Figure 4 and anticipated staging location shown on Figure 5.

Injection Lines: High Pressure Stainless Steel Braided Rubber one-inch-diameter injection lines will be utilized.

Injection Trailer: IET's self-contained injection trailer will be positioned at the Site for the duration of the injections. The trailer consists of two 200-gallon conical tanks capable of maintaining up to 30% solids as a suspension via lightning mixers; on-board generator; all stainless-steel piping system; two-inch pneumatic diaphragm pump with an operating pressure of 0 to 110 psi.; on-board 37 CFM/175 psig compressor with 240 gallons of air storage; self-contained eye wash and safety shower.

All chemicals will be unloaded and transferred in the work area utilizing a forklift that is appropriate for the weight being moved and terrain on which it is being operated in order to reduce the potential for exposure during normal chemical handling. Secondary containment constructed of material that is compatible with the chemical being stored will be used for spill prevention while chemicals are stored. Shop vacs, absorbent material, and books will be available on-site to immediately address any incident.

Injections will take place starting with downgradient points in a radial pattern prior to injections taking place in RW-1. This will aid in not only maintaining hydraulic control but will emplace remedial compounds downgradient so any impacted water migrating through this area will be in contact with the emplaced injectate. Volumes of injectate have been calculated to provide treatment while displacing the minimum amount of impacted water in the treatment zone.

Groundwater extraction will not occur during treatment to allow for the entire water-bearing zone to be treated (i.e. no 'drawdown') and to avoid removing amendment from the treatment zone. It is anticipated that extraction will not occur for 9 to 12 months. The GWE&TS will be restarted as needed; however, based on the success of the RSO,

restarting the GWETS may not be necessary. Care will be taken during injection to protect recovery wells so that they can be put back into service if needed.

6.0 GROUNDWATER MONITORING AND REMEDIAL SYSTEM OPTIMIZATION EFFECTIVENESS

Groundwater monitoring will be conducted at 45-90-120 days after completion of injection. Groundwater samples from the following wells will be collected and analyzed for CVOCs, ORP, DO, pH, conductivity, sulfate, other indicator parameters: MW-1R, MW-3, MW-4R, MW-6, MW-7, MW-8, MW-9, and MW-10. Groundwater sampling will be scheduled such that one sampling event coincides with the site-required annual groundwater sampling. At that time, as required by the SMP, samples will also be collected for CVOC analyses from the following wells: MW-4, MW-13, MW-14, MW-16, MW-17, MW-18, MW-19, and MW-20, MW-22, and MW-23. Quality Control samples, including duplicates and matrix spike/matrix spike duplicates (MS/MSD) will be collected at a rate of 1 per 20 groundwater samples. Well locations are shown on attached Figures 2 and 3 (taken from LaBella Pump Test Report 2024).

Groundwater sample collection and analyses will be conducted in accordance with the requirements of the most current SMP (amended 1/23/17). All purge water will be containerized for proper sampling, management and disposal. In general, laboratory analytical procedures will adhere to USEPA SW-846 third addition methodologies as appropriate. Samples will be analyzed by a NYSDOH ELAP certified laboratory. Analytical data will be reported as NYSDEC ASP Category B deliverables and a Data Usability Summary Report (DUSR) will be prepared.

The effectiveness of the RSO effort will be determined by evaluating the results of groundwater monitoring. Post-injection monitoring data will be compared to baseline data and graphed. Of note is that CVOC concentrations may ***increase*** in the early stages of treatment as CVOCs are released from the water-bearing formation. Subsequently, CVOC concentrations are expected to decrease significantly compared to baseline concentrations. All monitoring data will be provided to NYSDEC within two weeks of receipt.

If, at any time during groundwater monitoring, data and/or observations indicate that off-site migration of CVOCs in groundwater is occurring at an increased rate (compared to when the GWE&TS was in operation), NYSDEC will be consulted and immediate action will be taken to avoid increased off-site migration of affected groundwater.

7.0 OPERATION AND MAINTENANCE

Groundwater treatment by ERD will not require Operations, Maintenance and Management (OM&M) with the exception of the previously-described groundwater monitoring. All OM&M requirement of the SMP will continue to be met.

8.0 DOCUMENTATION

WEEKLY REPORTS

Daily remedial activities will be chronicled in detail in daily logbooks. Weekly reports, summarizing the week's progress and any minor changes or deviations from the RSOWP due to field conditions, will be sent to the DEC Project Manager via email no later than the following Tuesday. Photographs of work items will be provided as appropriate. Weekly reports will be submitted for the duration of field work, from initial evaluation through injection. Thereafter, work will be described in the required site monthly progress reports.

MONTHLY REPORTS

Monthly reports will be submitted to NYSDEC via email by the tenth day of the following month of the reporting period and will include the following information, as well as the information required by the SMP:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including anticipated sampling, inspections, analyses, and reporting;
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review ; and
- Other pertinent information related to RSOWP implementation and SMP activities.

FINAL REMEDIAL SYSTEM OPTIMIZATION REPORT

A RSO Report will be submitted to NYSDEC following implementation of the remedial actions defined in this RSOWP. The report will document that the remedial work required under this RSOWP has been completed in compliance with the RSOWP. The RSO Report will describe all field activities, present the results of groundwater monitoring, and provide conclusions and recommendations. The RSO Report delivery date will depend on the results of groundwater monitoring and is anticipated to be issued nine months after the completion of injection.

9.0 SCHEDULE

Remedial actions will begin upon receipt of written approval of this RSOWP from NYSDEC, assumed to occur on or before 15 May 2024. The anticipated schedule showing completion dates for RSOWP task is summarized below.

5/15/24 RSOWP Approval
5/20/24 Well and surface water infiltration evaluation
5/31/24 Water level measurements, baseline groundwater sampling
6/3/24 Obtain USEPA injection well permit
6/14/24 Mobilize ERD equipment and materials
6/21/24 Receive and review baseline groundwater data, provide to DEC
6/28/24 Complete ERD Injection, remove equipment from site, restoration as needed
8/12/24 First post-injection groundwater sampling
9/6/24 Review first post-injection groundwater data, summarize, provide to DEC
9/26/24 Second post-injection groundwater sampling (includes SMP annual sampling)
10/21/24 Review second post-injection groundwater data, summarize, provide to DEC
10/26/24 Third post-injection groundwater sampling
11/22/24 Review third post-injection groundwater data, summarize, provide to DEC
12/20/24 Submit Remedial System Optimization Report

Electronic data will be submitted in EQuiS. Ongoing OM&M, reporting will be conducted per RSOWP and SMP.

ATTACHMENTS

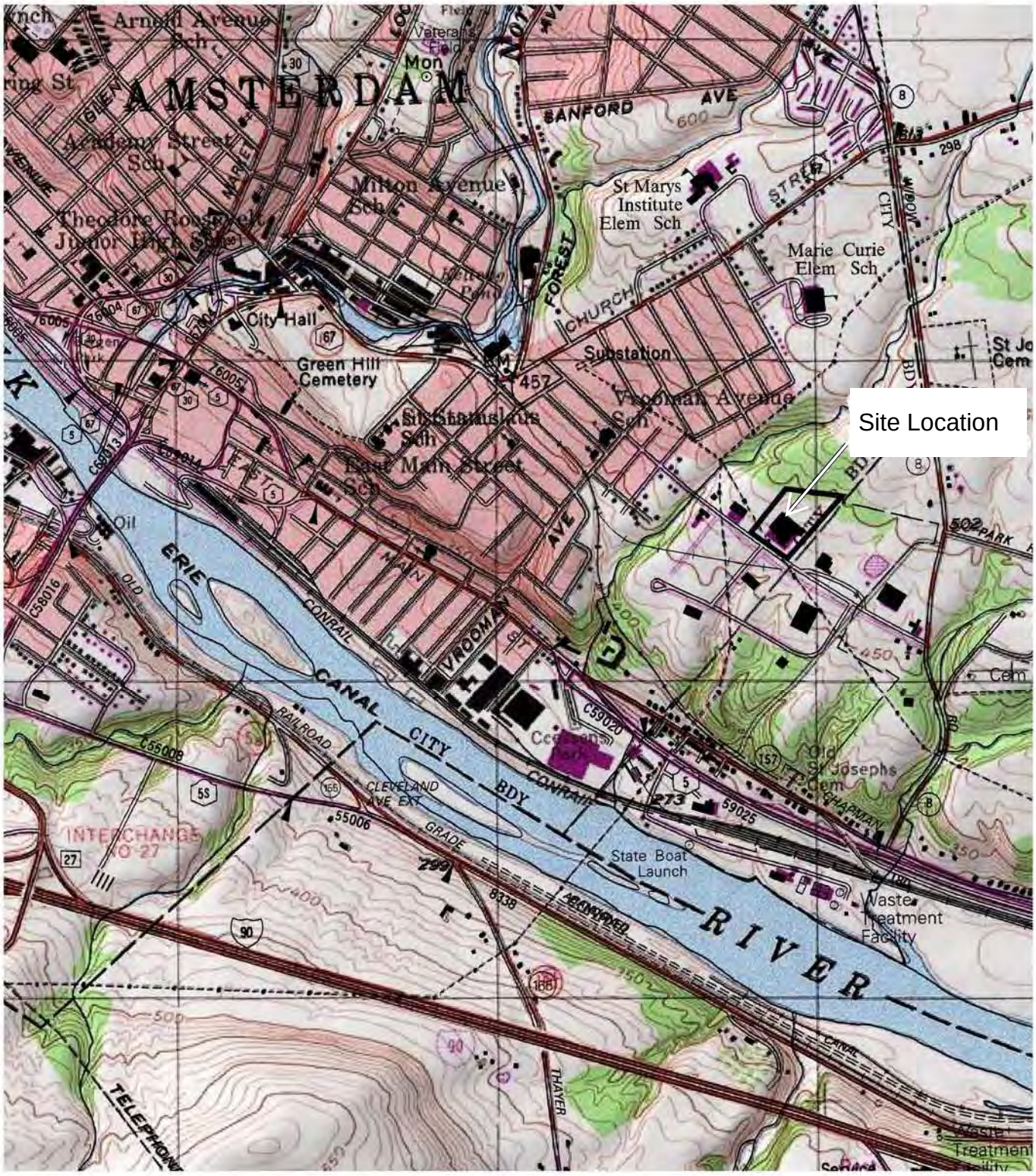


Figure 1
Site Location Map
61 Edson Street
Amsterdam, NY
NYSDEC Site No. 4-29-004

Source: Record of Decision (March, 2007)

NY NAD83 EAST

MW-18

MW-12

IRF

MW-22

MW-23

APPROXIMATE LOCATION OF BUILDING

SINGLE STORY COMMERCIAL BUILDING

APPROXIMATE LOCATION OF ASPHALT

GRASS

R: 467.1

ASPHALT

MW-14

SAM STRATTON ROAD

APPROXIMATE LOCATION OF ASPHALT

EDGE OF ASPHALT

GRASS

MULTIPLE STORY COMMERCIAL BUILDING

MW-13

MW-15

MW-17

MULTIPLE STORY COMMERCIAL BUILDING

GRASS

R: 464.3

R: 464.6

R: 465.0

MW-10

EDSON STREET

EDGE OF ASPHALT

RW-2

ASPHALT

MW-5R

ENVIRONMENTAL EASEMENT PER MAP REF. 1 SEE EASEMENT REFERENCE

MULTIPLE STORY COMMERCIAL BUILDING

APPROXIMATE LOCATION OF ASPHALT

MW-20

CRS

MW-9

MW-7

SYSTEM SHED

IW-04

MW-6

MW-2

GRASS

MW-1

MW-1R

R: 470.0

MW-11R

RW-1

MW-16

MW-8

IW-02

MW-4

MW-4R

IW-03

MW-3

GRASS

IRF

MW-19

MULTIPLE STORY COMMERCIAL BUILDING

80 0 80

SCALE IN FEET
1"=80'

LaBella
Powered by partnership
5 Mc-Crea Hill Road
Ballston Spa, NY 12020
518-885-5383
labellapc.com
C.A. NUMBER:
GEOLOGICAL: 018750
LAND SURVEYING: 017976
PROFESSIONAL ENGINEERING: 018281

ISSUED FOR:

DRAWING NAME:
Site Map with Environmental Easement

DRAWN BY:

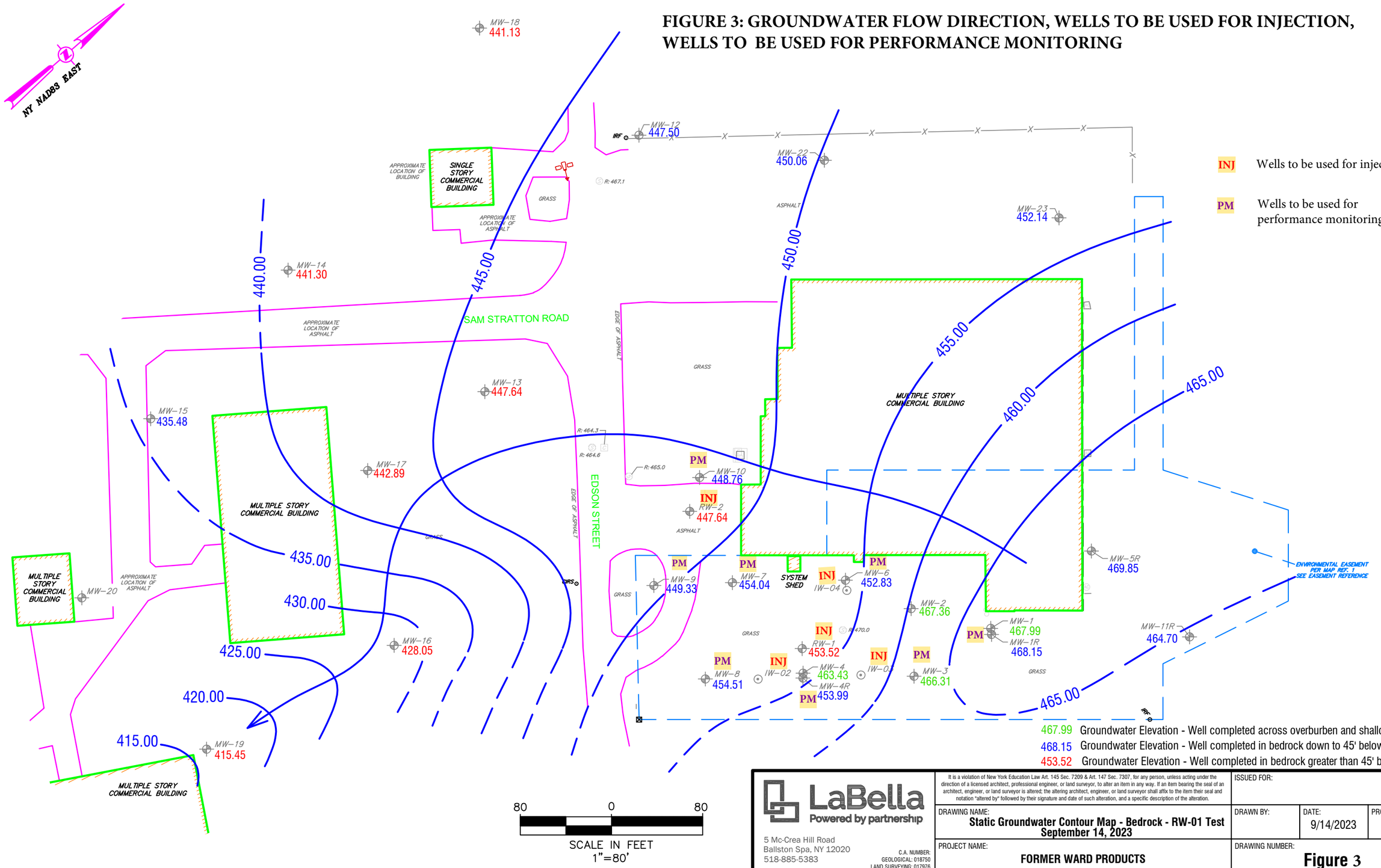
DATE: 09/02/2022

PROJECT NO.: 2211929

PROJECT NAME:
LANDS NOW OR FORMERLY OF 61 EDSON STREET, LLC
61 EDSON STREET, AMSTERDAM, NEW YORK 12010

DRAWING NUMBER:
Figure 2

FIGURE 3: GROUNDWATER FLOW DIRECTION, WELLS TO BE USED FOR INJECTION, WELLS TO BE USED FOR PERFORMANCE MONITORING



LaBella
Powered by partnership
5 Mc-Crea Hill Road
Ballston Spa, NY 12020
518-885-5383
labellapc.com
C.A. NUMBER:
GEOLOGICAL: 018750
LAND SURVEYING: 017976
PROFESSIONAL ENGINEERING: 018281

ISSUED FOR:

DRAWING NAME: **Static Groundwater Contour Map - Bedrock - RW-01 Test September 14, 2023**

DRAWN BY:

DATE: 9/14/2023

PROJECT NO.: 2211929

PROJECT NAME: **FORMER WARD PRODUCTS**
61 EDSON STREET, AMSTERDAM, NEW YORK 12010

DRAWING NUMBER: **Figure 3**

IET INJECTION SYSTEM
UNITED STATES PATENT 7,044,152

Injection Trailers Include: Multiple Liquid Feed Systems, Stainless Steel Piping, Isolated Compressed Gas Containment, Safety Shower, Eyewash Station, Onboard Generator, Chemical Resistant Construction, Mobile Office Space

Figure 4: Injection System

Figure 5
Location of injection trailer, work zone, support zone

APPENDIX A

2023 GROUNDWATER ANALYTICAL RESULTS

TABLE 2 - Summary of Field Measurements
August 22-24, 2023
Former Ward Products
61 Edson Street
Amsterdam, Montgomery County, New York
NYSDEC Site Number 429004

Monitoring Well	Top of Casing Elevation (ft)	Total Well Depth (ft TOC)	Depth to Water (ft)	Water Elevation (ft)	Turbidity (NTU)	D.O. (mg/L)	ORP (mV)	Conductivity (mS/cm)	pH (SU)	Temperature (^{o}f)
MW-1	471.22	7.45	3.45	467.77	NS	NS	NS	NS	NS	NS
MW-1R	470.85	18.17	3.70	467.15	109	10.30	178	563	10.3	63.8
MW-2	470.51	11.86	3.89	466.62	NS	NS	NS	NS	NS	NS
MW-3	472.36	7.56	5.59	466.77	NS	NS	NS	NS	NS	NS
MW-4	469.50	14.51	6.66	462.84	7.98	0.22	-130.1	516	6.9	52.9
MW-4R	469.68	34.31	19.69	449.99	3.03	0.41	59.8	460	7.3	47.7
MW-5R	471.26	16.33	1.57	469.69	1,000	7.28	332	687	6.6	67.6
MW-6	470.39	37.70	20.09	450.30	158	9.58	303	787	6.9	58.2
MW-7	468.46	34.10	18.49	449.97	136	9.98	270	734	7.4	58.9
MW-8	466.69	30.28	15.54	451.15	3.04	4.08	65.1	507	6.4	49.5
MW-9	464.71	46.62	26.66	438.05	6.03	0.22	-30.7	582	8.3	49.1
MW-10	466.09	50.80	28.40	437.69	8.16	0.35	45.2	552	7.3	50.7
MW-11R	481.45	24.51	16.60	464.85	NS	NS	NS	NS	NS	NS
MW-12	467.52	45.80	21.43	446.09	5.59	0.31	-73	465	7.4	50.9
MW-13	461.44	69.12	27.66	433.78	261	4.41	355	356	6.4	70.2
MW-14	452.75	60.94	NG	NG	NS	NS	NS	NS	NS	NS
MW-15	444.58	54.43	8.58	436.00	NS	NS	NS	NS	NS	NS
MW-16	448.75	67.30	21.80	426.95	7.12	0.54	108.1	135	12.2	46.9
MW-17	450.09	66.65	13.10	436.99	222	6.37	192	507	10.5	57.1
MW-18	462.98	66.05	NG	NG	NS	NS	NS	NS	NS	NS
MW-19	440.97	71.00	NG	NG	NS	NS	NS	NS	NS	NS
MW-20	441.99	53.20	22.60	419.39	NS	NS	NS	NS	NS	NS
MW-22	471.27	49.88	22.60	448.67	318	6.00	318	166	6.8	67.0
MW-23	472.35	45.15	21.84	450.51	26.8	0.27	41.7	536	7.3	54.7

DTW collected 8-22-2023
TOC elevations determined by LaBella 9-2-2022
WQFPs collected 8/22 - 24/2023
NG indicates well was not gauged on 8-22-2023
NS indicates that this well was not included in the August, 2023 groundwater sampling event.

Table 3
Groundwater Sample Analytical Results - VOCs
August 22-24, 2023
61 Edson Street, Amsterdam, NY
NYSDEC Site #4-029-004

		Compound								
		Carbon Tetrachloride	Chloroform	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	Vinyl Chloride	Acetone
Well ID	**Class GA Standard**	**5.0**	**7.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**2.0**	**50**
MW-1R	8/23/23	1.6	0.87 J	< 0.5	**6.2**	< 2.5	0.36 J	**41**	< 1.0	5.6
MW-4	8/23/23	< 0.5	< 2.5	< 0.5	**64**	< 2.5	0.21 J	**13**	**2.9**	< 5.0
MW-4R	8/23/23	< 120	< 620	< 120	< 620	< 620	**2,300**	**30,000**	< 250	< 1,200
MW-5R	8/23/23	0.6	< 2.5	< 0.5	3.6	< 2.5	< 0.5	3.8	< 1.0	< 5.0
MW-6	8/22/23	< 2.0	< 10	< 2.0	4.8 J	< 10	4.2	**450**	< 4.0	< 20
MW-7	8/22/23	< 0.5	< 2.5	< 0.5	1.4 J	< 2.5	1.5	**130**	< 1.0	< 5.0
MW-8	8/22/23	< 0.5	< 2.5	< 0.5	0.87 J	< 2.5	< 0.5	**44**	< 1.0	< 5.0
MW-9	8/22/23	< 0.5	< 2.5	< 0.5	< 2.5	< 2.5	< 0.5	**49**	< 1.0	< 5.0
MW-10	8/23/23	< 2.0	< 10	1.4 J	**13**	< 10	3.3	**390**	< 4.0	< 20
MW-12	8/23/23	< 0.5	< 2.5	1.2	**14**	1.1 J	< 0.5	**48**	< 1.0	< 5.0
MW-13	8/23/23	< 0.5	< 2.5	0.44 J	**25**	< 2.5	< 0.5	2.6	0.17 J	< 5.0
MW-14	NS	-	-	-	-	-	-	-	-	-
MW-16	8/24/23	< 0.5	< 2.5	< 0.5	< 2.5	< 2.5	< 0.5	< 0.5	< 1.0	< 5.0
MW-17	8/24/23	< 0.5	< 2.5	< 0.5	**6.3**	< 2.5	< 0.5	4.7	< 1.0	< 5.0
MW-18	NS	-	-	-	-	-	-	-	-	-
MW-19	NS	-	-	-	-	-	-	-	-	-
MW-20	NS	-	-	-	-	-	-	-	-	-
MW-22	8/23/23	< 0.5	< 2.5	< 0.5	< 2.5	< 2.5	< 0.5	1.1	< 1.0	< 5.0
MW-23	8/23/23	< 0.5	< 2.5	0.32 J	1.7 J	< 2.5	< 0.5	**61**	< 1.0	< 5.0

Notes:

All results reported in micrograms per liter (ug/L) unless otherwise specified.

Only those compounds detected in at least one sample are presented on this table.

< indicates compound was not detected at the reporting limit (RL) shown.

J - Estimated concentration. The target analyte concentration is below the RL but above the Method Detection Limit (MDL).

DCE = Dichloroethene

PCE = Tetrachloroethene

TCE = Trichloroethene

Bold - Value exceeds current NYSDEC Groundwater Standard.

NS indicates that monitoring well was not sampled during the August, 2023 annual sampling event.

Table 4
Groundwater Sample Analytical Results - Total Chromium
August 22-24, 2023
61 Edson Street, Amsterdam, NY
NYSDEC Site #4-029-004

		Total Chromium (ug/L)
Well ID	**NYSDEC Standard**	**50**
MW-1R	8/23/23	**340 J**
MW-4	8/23/23	< 10
MW-4R	8/23/23	< 10
MW-5R	8/23/23	NA
MW-6	8/22/23	< 10
MW-7	8/22/23	5.4 J
MW-8	8/22/23	NA
MW-9	8/22/23	< 10
MW-10	8/23/23	NA
MW-12	8/23/23	NA
MW-13	8/23/23	NA
MW-14	NS	-
MW-16	8/24/23	NA
MW-17	8/24/23	NA
MW-18	NS	-
MW-19	NS	-
MW-20	NS	-
MW-22	8/23/23	NA
MW-23	8/23/23	NA

Notes:

All results reported in ug/L unless otherwise specified.

"<" indicates that analyte was not detected at the reporting limit shown

J - Estimated value. The target analyte concentration is below the reporting limit (RL) but above the Method Detection Limit (MDL).

Bold - Value exceeds current NYSDEC Groundwater Standard.

APPENDIX B

SPILL PREVENTION AND RESPONSE PLAN

Revised: June 23rd, 2016

SPILL PREVENTION AND RESPONSE PLAN

The following are steps and procedures to follow by IET employees for preventing spills and responding to chemical or hazardous substance spills.

1) Spill Prevention
Hazardous Substance Management
All hazardous substances, including chemical wastes, are to be managed in a way that prevents release. The following general requirements are to be followed:

• Container Management:

- All hazardous substance containers must be labeled pursuant to OSHA hazardous communication guidelines and OSHA Safety Data Sheets (SDS) must be immediately available for review.
- All hazardous substance containers must be in good condition and compatible with the materials stored within.
- All hazardous substance containers must be accessible and spacing between containers must provide sufficient access to perform periodic inspections and respond to releases.
- Empty hazardous substance containers (drums) must have all markers and labels removed and the container marked with the word 'empty'.
- Any spills on the exterior of the container must be cleaned immediately.
- Flammable materials stored or dispensed from drums or totes must be grounded to prevent static spark.
- Do not overfill waste drums. 4"of headspace must remain to allow for expansion.

• Good Housekeeping:

- All hazardous substances must be stored inside buildings or under cover.
- Store hazardous substances not used daily in cabinets, or in designated areas.
- All chemicals that are transferred from larger to smaller containers must be transferred by use of a funnel or spigot.
- All hazardous substance containers should be closed while not in use.
- Use drip pans or other collection devices to contain drips or leaks from dispensing containers or equipment.
- Implement preventative maintenance activities to reduce the potential for release from equipment.
- Immediately clean up and properly manage all small spills or leaks.
- Periodically inspect equipment and hazardous substance storage areas to ensure leaks or spills are not occurring.
- Use signage to identify hazardous substance storage or waste collection areas.
- Keep all work areas and hazardous substance storage areas clean and in good general condition.

• Secondary containment:

- Store all bulk chemicals (>55 gallons) within appropriate secondary containment, or any sized chemical if there is a potential for release to the environment.

Spill Prevention and Response Plan

- Secondary containment should be checked periodically, and any spills identified in secondary containment must be immediately cleaned up and removed.

• Marking/labeling:

- Ensure all hazardous substances, including chemical wastes, are properly marked and labeled in accordance with all federal, state and local regulations.
- Ensure that hazardous substances transferred to small containers are marked with the chemicals name (example- "Isopropyl Alcohol") and hazard (example- "Flammable").

Employee Training

All employees must receive periodic training on the following topics:

1. Spill prevention practices
2. Where to locate and how to interpret OSHA SDS and pictograms.
3. Spill response plan
4. Emergency response procedures

Training must include a review of this Spill Prevention and Response Plan, and a review of location and use of emergency response equipment. Training can be recorded through safety committee meetings, staff training logs, or other equivalent record keeping.

Hazardous Substance Inventory

An inventory must be maintained for all stored hazardous substances <55 gallons, and/or list of locations where non-bulk hazardous substances are stored (i.e. flammable lockers - shop floor). Materials manufactured, stored, used and/or generated as a chemical waste in quantities >55 gallons should also be inventoried. Inventories should be maintained similar to the example shown below.

Hazardous Substance Manufacturer Quantity/Unit of Issue Location

(Example) Isopropyl Alcohol Acme Co. 60 / 1-gl Fleet Shop

Spill Response Equipment

Spill response equipment must be maintained and located in areas where spills are likely to occur. Spill kits should provide adequate response capabilities to manage any anticipated spill or release. The following general requirements are to be followed which include:

• Stock spill clean-up kits that are compatible with the hazardous substances stored on site.
• Locate spill kits in areas where spills are likely to occur (loading docks, chemical storage areas, locations where hazardous substances are being transferred).
• Spill kits should be sized to manage an anticipated release (spill equal to the largest container).
• Emergency response equipment should be inspected periodically to ensure that the spill kit is complete.

Spill Prevention and Response Plan

Spill response and first aid equipment, and fire alarm location(s) should be identified similar to the example shown below.

Locations Spill Equipment Content/Inventory

(Example) Loading Dock 40gl- Spill Kit including 65-gl over pack drum, universal adsorbent socks, pillows and pads, personal protective equipment, nonsparking shovel, disposable bags and ties & Emergency Response Guidebook.

2) Spill Response Plan

In the event of a hazardous substance spill or release, immediately review and follow applicable OSHA SDS guidelines. If doing so does not violate those guidelines, take the following measures to keep the spill from entering sewer or storm drains, spreading off-site, or affecting human health. In all cases caution and common sense must be maintained with the primary goal being to prevent and/or limit personal injury.

Stop, contain, and clean up the chemical spill if:

• The spilled chemical and its hazardous properties have been identified.
• The spill is small and easily contained.
• Responder is aware of the chemicals' hazardous properties.

If a spill or release cannot be controlled or injuries have occurred due to the release, the following procedures should be implemented:

• Call for help or alert others of the release.
• Evacuate immediate area, and provide care to the injured- Call 911.
• If potential fire or explosion hazards exist initiate evacuation procedures- Call 911.
• Respond defensively to any uncontrolled spills:
- Use appropriate personal protective equipment when responding to any spill.
- Attempt to shut off the source of the release (if safe to do so).
- Eliminate sources of ignition (if safe to do so).

- Protect drains by use of adsorbent, booms or drain covers (if safe to do so).
• Notify onsite emergency contact(s).
• Notify other trained staff and assist with the spill response and cleanup activities.
- Coordinate response activities with local emergency personnel (fire department).
• Be prepared to provide information to fire department, EMT, hospital or physician.
• Notify appropriate agency if a release has entered the environment. Refer to Notification and Reporting section for reporting thresholds.

Evacuation Procedures

In the event of a hazardous substance release that has the potential for fire, explosion or other human health hazards the following procedures will be implemented:
• Facility staff will be notified of evacuation by one or more of the following method(s): [Verbal, Intercom, Portable Radio, Alarm, Other].
• Notification to emergency services will be performed- Call 911.

Spill Prevention and Response Plan

• Facility staff will follow predetermined evacuation routes and assemble at designated areas. Evacuation maps must be displayed throughout the facility.
• Individuals responsible for coordinating evacuations must confirm if the business has been completely evacuated.
• Facility staff will be made familiar with evacuation procedures during new employee orientation, and annual trainings thereafter.
• Designated emergency response contacts will coordinate all activities with outside emergency personnel.

Spill Containment and Cleanup

Follow procedures identified in the SOP Spill Containment and Cleanup.

Reporting a Release

For Non-Emergencies:

Call Public Utilities Department. Public Utilities Department will follow standard procedures for reporting the incident to the appropriate entities; Call NYSDEC Spill Hotline (1-800-457-7362) if deemed appropriate.

For Emergencies:

Report incident directly to the entities listed below and as detailed on the Report and Response Flow Chart found in the SOP IET – Reporting and Response.

• NYSDEC Spill Hotline (1-800-457-7362)
• Health Department
• Fire Department (911)
• NYSDEC Inspector (Jolen Lozweski: 518-831-3838)

When reporting a release, be prepared to provide the following information (use spill report form):

• Your name and telephone number from where you are calling;
• Exact address of the release or threatened release;
• Date, time, cause and type of incident (fire, air release, spill, etc.)
• Material and quantity of the release, to the extent known;
• Information contained on the OSHA safety data sheets;
• Current condition of the facility;
• Extent of injuries, if any; and
• Possible hazards to the public health and/or environment outside of the facility.

Facility Map: Include emergency exits routes, fire alarms, fire extinguishers, spill response equipment and first aid stations (eye wash, first aid kits, etc.)

APPENDIX C

RSO HEALTH & SAFETY PLAN

INNOVATIVE ENVIRONMENTAL TECHNOLOGIES, INC.

SITE SPECIFIC HEALTH & SAFETY PLAN

Ward Products Site

61 Edson Street, Amsterdam, NY

March 2024

Innovative Environmental Technologies, Inc.

6071 Easton Road
Pipersville, PA 18947

(888) 721-8283

www.iet-inc.net

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Purpose

The purpose and use of this Health and Safety Plan (HASP) is limited to chemical surface application and soil and groundwater remediation projects. This plan has been developed for IET personnel; it is not intended for subcontractor or client use. This HASP describes the work to be performed and addresses health and safety concerns with respect to proposed field activities, as well as personal protection requirements and safe working practices, monitoring and site control procedures, and contingency plans for emergency situations.

IET personnel on this project with the potential to be exposed to hazardous circumstances must meet the training requirements of 29 CFR 1910.120(e) and be participating in a medical surveillance program as per 29 CFR 1910.120(f). Eating, drinking and smoking will only be allowed in designated areas of the support zone.

This plan is valid only for the specific project and work scope identified in the following sections. The Project Manager and Site Safety Officer (SSO) are responsible for implementation of this plan, which includes the site safety briefing. Field activities include providing general oversight in accordance with the project's work plan, measuring and mixing materials used in injections, running various pieces of equipment and obtaining groundwater samples for laboratory analysis.

Site Description

The Site is:

Ward Products Site

61 Edson Street, Amsterdam, NY

(herein referred to as the Site).

Based on information provided by the Client the following contaminants of concern (COCs) have been identified and/or suspected to be present at the Site:

- Chlorinated Volatile Organic Compounds (CVOCs), primarily Trichloroethene (TCE)

Scope of Work (SOW)

IET is implementing a groundwater remedial plan at the subject site. The objective of the remediation is to promote the conditions in-situ, necessary for accelerated dechlorination via both abiotic and microbial processes, and the precipitation of the heavy metals as insoluble materials. The main chemicals of concern are CVOCs in subsurface soils and groundwater in the bedrock formation. In order to accomplish the degradation of the contaminants of concern, a reductive dechlorination injection slurry will be injected to targeted zones in the subsurface. This amendment will be injected through permanent wells.

Injection Operations

- Handling, mixing and injection of slurry components into 5 permanent wells .

Organizational Structure & Responsibilities

IET personnel responsible for field activities at this Site are identified in the below table.

Responsible Personnel for the Site

Title/Responsibilities	Name	Office	Cell Phone
IET Project Manager (PM) Responsible for managing the overall project in regard to the SOW, design and field implementation.	Wade Meese	(740) 965-6100	(614) 540-1246
IET Site Supervisor Responsible for leading the field team and implementing the SOW and HASP.	Ian Connor	(215) 766-1603	(267) 884-1760
IET Site Safety Officer (SSO) Responsible for Site health and safety of field team.	Ian Connor	(215) 766-1603	(267) 884-1760
Health & Safety Plan Preparer Responsible for completion of the site-specific HASP based on information known about site history and proposed SOW.	Wade Meese	(740) 965-6100	(614) 540-1246

Hazard Assessment

Identified potential hazards include chemical reagent injection materials, physical, chemical, and biological hazards. These hazards are discussed in the following sections.

Potential Chemical Hazards

This section describes the toxicological (health) hazards associated with exposure to organic and inorganic chemicals and metals during field activities at the Site. Chemicals which have been identified and/or are suspected to be present at the Site are discussed below.

Chlorinated Solvents (CVOCs)

Trichloroethene (a.k.a. Trichloroethylene, TCE) is a colorless, volatile liquid. Liquid trichloroethylene evaporates quickly into the air. It is nonflammable and has a sweet odor. The two major uses of trichloroethylene are as a solvent to remove grease from metal parts and as a chemical that is used to make other chemicals, especially the refrigerant, HFC-134a. Trichloroethylene has also been used as an extraction solvent for greases, oils, fats, waxes, and tars; by the textile processing industry to scour cotton, wool, and other fabrics; in dry cleaning operations; and as a component of adhesives, lubricants, paints, varnishes, paint strippers, pesticides, and cold metal cleaners. HHS has classified trichloroethylene as "known to be a human carcinogen" based on sufficient evidence of carcinogenicity from humans.

There is a limited opportunity for exposure to TCE and its breakdown products at this site as invasive work is not planned. Care will be taken to wear protective clothing when conducting tasks that might result in contact with groundwater containing elevated concentrations of TCE and its breakdown products.

Physical Hazards

Physical hazards are inherently present during the injections and sampling activities. Common physical hazards include mechanical hazards; slip-trip-fall hazards associated with the field environment; hazards associated with weather conditions; musculoskeletal injury resulting from lifting tasks and well bailing activities. The typical physical hazards anticipated being present on the site and the methods for preventing injury due to these hazards are described below.

General Physical Hazards

The Site may include ditches, areas that are poorly drained, rough or uneven terrain, depressed areas (that may present oxygen deficiency or flammable gas collection areas), protruding objects, and impalement hazards. The IET SSO will ensure that a careful pre-work walkover is made of all work areas and potential access or egress routes. Unsafe areas may be flagged or taped by the IET SSO and will be identified to all personnel.

Heavy Equipment

In all cases, heavy equipment with rotating shafts or gears will be guarded to prevent accidental contact. Only experienced IET personnel are allowed to work around rotating parts that cannot be adequately guarded. Personnel who must work around rotating equipment will not wear loose-fitting clothes that could get caught. Special precautions should be observed during drilling operations involving casing removal to avoid potential accidents due to equipment failure or breakage.

IET personnel will maintain and implement safety procedures according to this HASP. Only trained and qualified IET personnel will operate heavy equipment during field activities. All appropriate safety devices

on all machinery and rotating equipment (e.g., backup alarms, emergency stops, and guards) will be maintained and operational at all times.

During all site activities, personal protective equipment (PPE) such as steel-toed shoes, safety glasses or goggles, and hard hats should be worn whenever such equipment is present, and personnel should at all times be aware of the location and operation of heavy equipment, and take precautions to avoid getting in the way of its operation.

Well Bailing

Muscle and joint strains can occur with well bailing. To minimize the occurrence of injury, before beginning work, stretch or warm up the body as you would prior to exercising.

High Pressure Hoses

High-pressure hose ends may whip if the fitting becomes disconnected. All hose ends will be secured to minimize whipping, and connections should be secured to prevent accidental disconnects. Appropriately rated whip chains and/or straps will be used at connection points where the potential for accidental disconnect is present.

Falling, Slipping, and Tripping

Slip-trip fall hazards are common at field sites due to open holes; muddy, slippery or unstable surfaces; and equipment on the ground. While it is difficult to eliminate all slip-trip-fall hazards, risk of injury will be minimized by implementing safe work practices, utilizing proper footwear, and keeping the work area free of obstructions. Foot traffic will avoid areas where materials are stored on the ground. Tools and materials will not be left randomly on surfaces when not in direct use. The IET Site Supervisor and/or SSO will ensure that work areas are maintained in a neat and orderly state. Hoses and cables (if used) will be grouped and routed to minimize hazards.

Lifting Hazards

Field operations often require the performance of laborious tasks. During any manual material-handling tasks, personnel will lift with the force of the load suspended on their legs and not on their backs. An adequate number of personnel or an appropriate mechanical device must be used to safely lift or handle heavy equipment or materials. When heavy objects must be lifted manually, personnel will keep the load close to the body and will avoid any twisting or turning motions to minimize stress on the lower back.

Fire / Explosion

A potential exists at the site for an explosion or fire due to an ignition of explosive or flammable materials. Explosions and fires not only pose the obvious hazard of intense energy/heat, open flame, and smoke inhalation, they may also cause the release of toxic chemicals into the environment. In general, IET personnel will protect against the hazard by implementing the following safety procedures:

- All potential ignition sources will be kept away from an explosive or flammable environment;
- Non-sparking, explosion-proof equipment will be used when necessary.

In the event fire or explosion becomes a threat, all personnel will be evacuated to a predetermined evacuation area until the hazardous situation is properly controlled or eliminated.

Noise

Working near a drill rig, near operating injection pumps, or a number of other Site activities, can subject

personnel to noise exposures in excess of allowable limits. Non-essential personnel who do not need to be next to loud equipment should stay as far away as possible to lower the risk of noise-induced hearing loss. Personnel who operate or must work next to drill rigs or operating injection pumps and/or generators will be required to wear hearing protection (ear plugs or muffs) to reduce their exposure to excessive noise. Persons who enter areas in excess of 85 decibels (dB) will be required to wear hearing protection.

Electrical Equipment

Any electrical equipment used during work activities may pose a hazard. To minimize electrical hazards, low-voltage (below 250 volts AC) equipment with ground-fault interrupters (GFI) and water-tight, corrosion resistant cables should be used. Worn switches and wiring should be quickly repaired and use of water should be controlled. Equipment should also be properly grounded as protection against shock, static, electricity, and lightning. Lockout/tagout procedures should be implemented whenever there is the possibility of a hazard due to unexpected energization during repair or maintenance of equipment.

Work Area Protection and Traffic

Because some of the project operation may be undertaken in a roadway or parking lot, motor vehicles may be a hazard. The work area must be properly protected by safety cones or caution tape. The use of protective barricades around site activity locations is required. The field vehicle may also be used as a safety barricade. In addition, personnel performing site activities are required to wear orange safety vests while in high traffic areas.

Biological / Environmental Hazards

In addition to known potential site hazards, site personnel should survey the area for other hazards such as biological hazards (i.e., raw sewage/cesspools, sanitary landfills, hospital wastes, and dead animals). A quick survey should also be performed for additional environmental hazards (i.e., bees, wasps, snakes, dogs, poison ivy, poison oak, etc.). If any additional hazards are identified during the survey the appropriate precautions will be taken in the field to ensure contact is not made with these hazards.

Weather

Weather conditions are an important consideration in planning and conducting site operations. Extremely hot or cold weather can cause physical discomfort, loss of efficiency and personal injury. Of particular importance at field sites is heat stress, often resulting from the use of impermeable protective clothing, which decreases the body's natural cooling processes. Lightning may accompany storms, creating an electrocution hazard during outdoor operations. To eliminate this hazard, weather conditions will be monitored and work suspended during electrical storms.

The following potential weather hazard exists at the site:

	Moderate temperatures therefore, heat and cold stress is not expected to be a factor.
X	Project activities will be conducted periodically therefore; heat and cold stress factors must be evaluated in the field (see Attachment - Information Sheet).
	Heat Stress (see Attachment - Information Sheet).
	Cold Stress (see Attachment - Information Sheet).

Hazard Communication

The following chemicals will be used at the Site. Safety Data Sheets (SDSs) for all chemicals can be found in the attachments of this plan.

X	Gasoline		Zero Valent Iron (ZVI)
	Diesel Fuel		Emulsified Zero Valent Iron (EZVI)
	Sodium Persulfate		Provect-Ox
	Ferric Oxide		Vitamin B2
	Hydrogen Peroxide		Vitamin B12
X	Provect-ERD-CH4		Sodium Sulfite
	Calcium Propionate		Nutrient Blend
X	Compressed Nitrogen Gas		Hydrolyzed Kelp
	Red Yeast Rice		Yeast Extract

Hazard Monitoring

During field activities, any potentially toxic air contaminants and/or explosive gas mixtures shall be monitored.

Monitoring Methods and Action Levels

Hazard	Screening Method	Action Level	Action Required
Organic Vapor (CVOC Suspected)	PID/FID	0 to 5 ppm above background	No action
		Greater than 5 ppm	Level C Protection APR w/ OV Cartridge
		Greater than 50 ppm	Stop Work
Organic Vapor (CVOC Absent)	PID/FID	0 to 25 ppm above background	No action
		Greater than 25 ppm	Level C Protection APR/Full or Half Organic Vapor Cartridge
		Greater than 200 ppm	Stop Work
Hydrogen Sulfide	Hydrogen Sulfide Meter	1 to 9 ppm	Continuous Monitoring
		Greater than 10 ppm	Level C Protection APR/Full-face Acid Gas Cartridge
		Greater than 50 ppm	Stop Work
Combustible Gas	Explosimeter/ Combustible Gas Indicator	Less than 10% LEL	No Action
		10% to 20% LEL	Continuous Monitoring Non-sparking Tools Only
		Greater than 20% LEL	Stop Work
Oxygen Concentration	Oxygen Analyzer	Less than 20	Leave area Evaluate Cause
		20% to 23%	Normal Range
		Greater than 23% LEL	Investigate Cause Stop All Spark Inducing Activity
Dust	Mini-RAM	Greater than 50 ug/m^3	Respiratory Protection N95 Dust Mask P100 Particulate Respirator/Cartridge
Carbon Monoxide (CO)	Carbon Monoxide Detector or Multi-Gas Detector with CO Sensor	0 to 35 ppm	No Action
		Greater than 35 ppm	Ventilation/Exhaust Controls Continuous Monitoring
		Greater than 100 ppm	Stop Work
Carbon Dioxide (CO2)	Carbon Dioxide Detector or Multi-Gas Detector with CO Sensor	0 to 1,000 ppm	No Action
		Greater than 5,000 ppm	Ventilation/Exhaust Controls Continuous Monitoring
		Greater than 10,000 ppm	Stop Work

Site Control

Work area barricades will be used, as necessary to prevent access by unauthorized persons. Yellow caution tape and/or sawhorse-type barricades can be used for this purpose.

Decontamination Procedures

Wash hands thoroughly before eating; clean work area and wash hands and face when work activities are completed. Equipment decontamination shall follow standard equipment decontamination guidelines. This includes steam cleaning or washing with a low phosphate detergent, all tools and equipment that encounter any chemicals of concern. Formal decontamination procedures are required if the analyzer reading exceeds 5 ppm in the operators breathing zone (OBZ) or if personnel are exposed to organic or metal contaminated dusts. In case of an emergency, no immediate decontamination will be needed.

Heat Illness Prevention

Altitude, geographic location, season and PPE may increase the potential for IET personnel working outdoors to experience heat illness. IET personnel shall have sufficient drinking water on-site during field activities. Whenever possible IET personnel will take breaks in cool shaded areas. Access to shade or a vehicle with working air conditioner will be available for all personnel when any person believes they need a preventative recovery period.

Personal Protective Equipment

The anticipated level of PPE for most of the field activities at the Site will be Level D and modified Level D. If deemed necessary that the PPE level needs to be increased due to air monitoring, all work will cease until further direction is given by the project manager.

R = Required	**A = As Needed**		
A	Hard Hat	A	Tyvek Suit
R	Hearing Protection	R	Fire Extinguisher
R	Steel-Toed Boots	R	First Aid Kit
A	Reflective Safety Vest		
R	Eye Protection (Safety Glasses)		
A	Gloves (Nitrile)		

Drilling activities will require the following personal protection: Hard Hat, Steel-toed Boots, gloves, and Safety Glasses. Hearing protection will be used by persons working at or around the drilling rig. A reflective safety vest will be worn when work is being conducted adjacent to the roadway.

Medical Surveillance

All IET personnel are required to participate in the IET medical surveillance program before being permitted to work on-site. Specific exceptions to the medical surveillance requirements may be granted by the SSO for site access by personnel performing non-intrusive activities and when the potential for exposure to site contaminants/chemicals is considered negligible while performing such non-intrusive activities (e.g. delivering supplies and materials to the site).

Spill Response and Recovery

Most spills that may occur on IET projects are the result of "surfacing" or "daylighting", which is often a natural aspect of an injection program where liquids and slurries are being forced into the subsurface under pressure. These occurrences are considered to be non-emergency or incidental releases and as such, IET personnel are competent in the procedures used to clean up these non-emergency, incidental spills and releases. Incidental releases are those that:

- Do not pose a significant safety or health hazard to personnel in the immediate area or to the persons assigned to clean it up;
- do not have the potential to become an emergency within a short period of time frame;
- do not present a potential for fire or explosion; or
- are limited in quantity, exposure potential, or toxicity.

The following steps will be implemented in the event of a spill or surfacing (if applicable):

- The IET Site Supervisor and SSO will be notified immediately.
- Attempts shall be made to stop the source of the spill;
- shut off pumps, close valves and follow any other safety procedures for emergency shutdown of equipment as applicable;
- contain (dike) the spill using absorbent materials (booms, socks, pads, earth etc);
- determine if the spill can be completely contained/recovered with available resources;
- if necessary provide additional delineation of area using barricades, signage or personnel and restrict non-essential personnel from entering the area during containment or recovery;

- residual material will then be washed thoroughly with water (if practical) to prevent slips, trips, and falls.

Emergency Response

In the event of a medical emergency or fire during field activities at the Site, the emergency telephone number shall be called from the Site on a mobile telephone or land line. A mobile telephone will be available during all field activities.

The IET Site Supervisor and/or SSO will notify the IET Project Manager immediately after appropriate medical aid has been rendered or emergency services have been summoned. A copy of the route to the nearest emergency medical facility is included as Appendix A.

Emergency Contact Information

Agency	Address	Phone Number
Emergency Medical Facility	427 Guy Park Avenue, Amsterdam, NY	518-842-1900
Medical, Fire, or Police	Routed to nearest provider via 911	911
Site Specific Emergency Contact	Add if available. Otherwise IET SSO to complete on-site if applicable.	

Health and Safety Plan Reviews & Approval

IET Site Supervisor/Site Safety Officer (SSO) Review and Acknowledgement

I acknowledge receipt of this HASP and accept that it is my responsibility to explain its contents to all Site personnel and cause these requirements to be fully implemented. Any change in conditions, scope of work, or other change that might affect worker safety requires me to notify the IET Project Manager.

Site Supervisor/SSO (Name/Signature)	Date Reviewed

IET Project Manager Review and Acknowledgement

I have read and approved this Health and Safety Plan (HASP) with respect to project hazards, regulatory requirements, and IET procedures. The final approved version of this HASP has been provided to the IET Site Supervisor and Site Safety Officer.

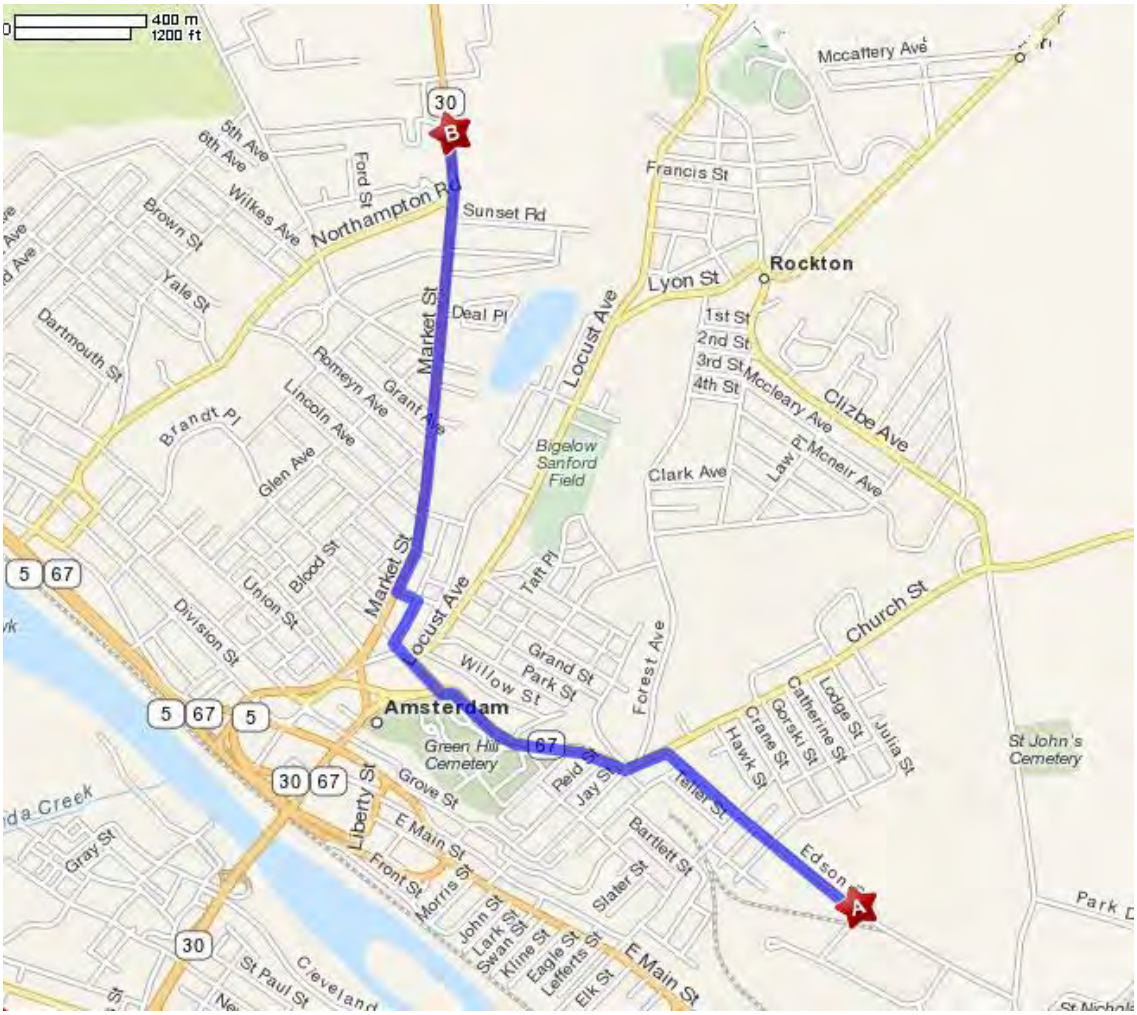
Project Manager (Name/Signature)	Date Reviewed

Health and Safety Plan Review and Acknowledgement Page

All IET Site personnel are required to read the contents of this HASP and by signing below, acknowledge that they are familiar with and will abide by its provisions.

Name	Company	Signature	Date

Attachment A - Hospital Route



Directions to the Hospital
Start: 61 Edson Street, Amsterdam, NY 12010
1. Head **northwest** on **Edson St** toward **Sam Stratton Rd (West)**0.6 mi
2. Turn **left** at **Church Street** 0.1 mi
3. Turn **right** to stay on **Church Street** 0.4 mi
4. Take 2nd **right** onto **Prospect Street** 0.2 mi
5. Take 3rd **right** onto **Elizabeth Street** 0.1 mi
6. Take the 1st **left** onto **Storrie Street** 240 ft
7. Turn **right** at **NY-30 N/Market Street**
Continue to follow **NY-30 N**, Destination on the **left** 1.1 mi
End: Amsterdam Memorial Healthcare: Foundation
5010 State Highway 30, Amsterdam, NY 12010-7532
• Total Distance: 2.5 Miles

Attachment B - Safety Data Sheets

SAFETY DATA SHEET
(Antimethanogenic) Anaerobic Biostimulant
ERD-CH4™: ERD-CH4™ (+DVI optional)

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **ERD-CH4™: ERD-CH4™ (+DVI)**
GENERAL USE: **Bioremediation of halogenated organics and metals**

MANUFACTURER:

Provectus Environmental Products, Inc
2871 W. Forest Rd. #2
Freeport, IL 61032
(815) 650-2230

EMERGENCY TELEPHONE:

Within USA and Canada: 1-800-424-9300
+1 703-527-3887 (collect calls accepted)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Product is generally recognized as safe. May cause irritation exposure to eyes. Long term contact to skin may cause some drying and minor irritation.

3. COMPOSITION INFORMATION ON INGREDIENTS

Proprietary mixture of fatty acids, glycerol, vegetable oils, garlic*, yeast extracts*, organic iron* and emulsifying agent.

INGREDIENT:	CAS NO.	% WT	% VOL	Toxic Release Inventory (TRI) Listed Chemicals
Iron (Fe)(*)	7439-89-6	0 – 20	NA	NA
Glycerol	56-81-5	2 – 10	NA	NA
Oleic Acid	112-80-1	20 – 50	NA	NA
Food Grade Veg Oil	8001-22-7	10 – 50	NA	NA
Potable Water	7732-18-5	10 – 40	NA	NA
Yeast Extracts(*)	8013-01-2	0 – <5	NA	NA
Garlic(*)	539-86-6	0 – <10	NA	NA

*(some formulations contain these materials)

4. FIRST AID MEASURES

EYES: Immediately flush with water for up to 15 minutes. If irritation persists, seek medical attention.

SKIN: Rinse with water. Irritation is unlikely, but if irritation occurs or persists, seek medical attention.

INGESTION: Generally safe to ingest but not recommended.

INHALATION: No first aid required.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Deluge with water

FIRE/EXPLOSION HAZARDS: Product is combustible only at temperatures above 600C

FIRE FIGHTING PROCEDURES: Use flooding with plenty of water, carbon dioxide or other inert gasses. Wear full protective clothing and self-contained breathing apparatus. Deluging with water is the best method to control combustion of the product.

FLAMMABILITY LIMITS: non-combustible

SENSITIVITY TO IMPACT: non-sensitive

SENSITIVITY TO STATIC DISCHARGE: non-sensitive

6. ACCIDENTAL RELEASE MEASURES

Confine and collect spill. Transfer to an approved DOT container and properly dispose. Do not dispose of or rinse material into sewer, stormwater or surface water. Discharge of product to surface water could result in depressed dissolved oxygen levels and subsequent biological impacts.

7. HANDLING AND STORAGE

HANDLING: Protective gloves and safety glasses are recommended.

STORAGE: Keep dry. Use first in, first out storage system. Keep container tightly closed when not in use. Avoid contamination of opened product. Avoid contact with reducing agents.

8. EXPOSURE CONTROLS – PERSONAL PROTECTION

EXPOSURE LIMITS

Chemical Name	ACGIH	OSHA	Supplier
ERD-CH4	**NA**	**NA**	**NA**

ENGINEERING CONTROLS: None are required

PERSONAL PROTECTIVE EQUIPMENT

EYES and FACE: Safety glasses recommended
RESPIRATOR: none necessary
PROTECTIVE CLOTHING: None necessary
GLOVES: rubber, latex or neoprene recommended but not required

9. PHYSICAL AND CHEMICAL PROPERTIES

Odor:	none to mild pleasant organic odor
Appearance:	milky
Auto-ignition Temperature	Non-combustible
Boiling Point	>600 C
Melting Point	NA
Density	0.90 - 1.02 gram/cc
Solubility	infinite
pH	7-9

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Do not contact with strong oxidizers
STABILITY: product is stable
POLYMERIZATION: will not occur
INCOMPATIBLE MATERIALS: strong oxidizers
HAZARDOUS DECOMPOSITION PRODUCTS:

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
A: General Product Information
Acute exposure may cause mild skin and eye irritation.
B: Component Analysis - LD50/LC50

No information available.

B: Component Analysis - TDLo/LDLo
TDLo (Oral-Man) none

Carcinogenicity
A: General Product Information
No information available.
B: Component Carcinogenicity
Product is not listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Epidemiology
No information available.

Neurotoxicity
No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity
Discharge to water may cause depressed dissolved oxygen and subsequent ecological stresses

Environmental Fate
No potential for food chain concentration

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Material is not considered hazardous, but consult with local, state and federal agencies prior to disposal to ensure all applicable laws are met.

14. TRANSPORT INFORMATION

NOTE: The shipping classification information in this section (Section 14) is meant as a guide to the overall classification of the product. However, transportation classifications may be subject to change with changes in package size. Consult shipper requirements under I.M.O., I.C.A.O. (I.A.T.A.) and 49 CFR to assure regulatory compliance.

US DOT Information
Shipping Name: Not Regulated
Hazard Class: Not Classified
UN/NA #: Not Classified
Packing Group: None
Required Label(s):None

50thEdition International Air Transport Association (IATA):
Not hazardous and not regulated

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

Material is not regulated under IMDG

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III

SECTION 311 No Hazard for Immediate health Hazard
SECTION 312 No Threshold Quantity
SECTION 313 Not listed

CERCLA NOT REGULATED UNDER CERCLA

TSCA NOT REGULATED UNDER TSCA

CANADA (WHIMS): NOT REGULATED

16. OTHER INFORMATION

HMIS:

Health	0
Flammability	0
Physical Hazard	0
Personal Protection	E

E: Safety Glasses, gloves

Safety Data Sheet

SECTION 1 CHEMICAL IDENTIFIER AND COMPANY IDENTIFICATION

Chevron and Texaco Unleaded Gasolines (All Grades)

Recommended Use of the Chemical and Restrictions on Use: Fuel
Synonyms: Automotive; Calco Mid-Grade Unleaded Gasoline; Calco Premium Gasoline; Calco Regular Unleaded Gasoline; CHEVRON and TEXACO MID-GRADE UNLEADED GASOLINES; CHEVRON and TEXACO PREMIUM UNLEADED GASOLINES; CHEVRON and TEXACO REGULAR UNLEADED GASOLINES; Chevron Mid-Grade Unleaded Gasoline; Chevron Plus Unleaded Gasoline; Chevron Premium Unleaded Gasoline; Chevron Regular Unleaded Gasoline; Chevron Supreme Plus Unleaded Gasoline; Chevron Supreme Unleaded Gasoline; Chevron UL/CQ Gasoline; GASOLINE (GENERIC); Gasolines; Texaco Power Plus Gasoline; Texaco Power Premium Unleaded Gasoline; Texaco Unleaded Gasoline; UNLEADED GASOLINE FOR EXPORT
Company Identification
Chevron Products Company
6001 Bollinger Canyon Rd.
San Ramon, CA 94583
United States of America

Transportation Emergency Response
CHEMTREC: (800) 424-9300 or (703) 527-3887
Health Emergency
Chevron Emergency & Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623
Product Information
Product Information: (800) 582-3835
SDS Requests: lubemsds@chevron.com

SPECIAL NOTES: This MSDS applies to: all motor gasoline.

SECTION 2 HAZARDS IDENTIFICATION

CLASSIFICATION:
- Flammable liquid: Category 1.
- Aspiration toxicant: Category 1.
- Carcinogen: Category 1B.
- Eye irritation: Category 2A.
- Germ Cell Mutagen: Category 1B.
- Reproductive toxicant (developmental): Category 2.
- Skin irritation: Category 2.
- Target organ toxicant (central nervous system): Category 3.
- Target organ toxicant (repeated exposure): Category 2.
- Acute aquatic toxicant: Category 2.
- Chronic aquatic toxicant: Category 2.

Signal Word: Danger
Physical Hazards:
- Extremely flammable liquid and vapour (H224).

Health Hazards:
- May be fatal if swallowed and enters airways (H304).
- Causes skin irritation (H315).
- Causes serious eye irritation (H319).
- May cause drowsiness or dizziness (H336).
- May cause genetic defects (H340).
- May cause cancer (H350).
- Suspected of damaging the unborn child (H361D).
- May cause damage to organs (Blood/Blood Forming Organs) through prolonged or repeated exposure (H373).

Environmental Hazards:
- Toxic to aquatic life with long lasting effects (H411).

PRECAUTIONARY STATEMENTS:
General:
- Keep out of reach of children (P102).
- Read label before use (P103).

Prevention:
- Obtain special instructions before use (P201).
- Do not handle until all safety precautions have been read and understood (P202).
- Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking (P210).
- Keep container tightly closed (P233).
- Keep cool (P235).
- Ground and bond container and receiving equipment (P240).
- Use explosion-proof electrical/ventilating/lighting/equipment (P241).
- Use non-sparking tools (P242).
- Take action to prevent static discharge (P243).
- Do not breathe dust/fume/gas/mist/vapours/spray (P260).
- Wash thoroughly after handling (P264).
- Use only outdoors or in a well-ventilated area (P271).
- Avoid release to the environment (P273).
- Wear protective gloves/protective clothing/eye protection/face protection (P280).

Response:
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician (P301+P310).
- IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower (P303+P361+P353).
- IF INHALED: Remove person to fresh air and keep comfortable for breathing (P304+P340).
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing (P305+P351+P338).
- IF exposed or concerned: Get medical advice/attention (P308+P313).
- Specific treatment (see Notes to Physician on this label) (P321).
- Do NOT induce vomiting (P331).
- If skin irritation occurs: Get medical advice/attention (P332+P313).

- If eye irritation persists: Get medical advice/attention (P337+P313).
- Wash contaminated clothing before reuse (P363).
- In case of fire: Use media specified in the SDS to extinguish (P370+P378).
- Collect spillage (P391).

Storage:
- Store in a well-ventilated place. Keep container tightly closed (P403+P233).
- Store locked up (P405).

Disposal:
- Dispose of contents/container in accordance with applicable local/regional/national/international regulations (P501).

SECTION 3 COMPOSITION/ INFORMATION ON INGREDIENTS

This material is a mixture.

COMPONENTS	CAS NUMBER	AMOUNT
Gasoline	86290-81-5	100 %volume
Toluene	108-88-3	1 - 35 %volume
Pentane, 2,2,4-trimethyl-	540-84-1	10 - 15 %volume
Xylene	1330-20-7	1 - 15 %volume
Trimethylbenzene (3 isomers: 1,2,3-; 1,2,4-; 1,3,5-isomer)	25551-13-7	5 - 10 %volume
Pentane isomers (pentanes)	Mixture	1 - 13 %volume
Butane	106-97-8	1 - 12 %volume
Ethanol	64-17-5	0 - 10 %volume
Hexane	110-54-3	1 - 5 %volume
Benzene	71-43-2	0.1 - 5 %volume
Heptane	142-82-5	1 - 4 %volume
Cyclohexane	110-82-7	1 - 3 %volume
Ethylbenzene	100-41-4	0.1 - 3 %volume
Methylcyclohexane	108-87-2	1 - 2 %volume
Naphthalene	91-20-3	0.1 - 2 %volume

Motor gasoline is considered a mixture by EPA under the Toxic Substances Control Act (TSCA). The refinery streams used to blend motor gasoline are all on the TSCA Chemical Substances Inventory. The appropriate CAS number for refinery blended motor gasoline is 86290-81-5. The product specifications of motor gasoline sold in your area will depend on applicable Federal and State regulations.

SECTION 4 FIRST AID MEASURES

Eye: Flush eyes with water immediately while holding the eyelids open. Remove contact lenses, if worn, after initial flushing, and continue flushing for at least 15 minutes. Get immediate medical attention.
Skin: Wash skin with water immediately and remove contaminated clothing and shoes. Get medical attention if any symptoms develop. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.
Ingestion: If swallowed, get immediate medical attention. Do not induce vomiting. Never give anything by mouth to an unconscious person.
Inhalation: Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue or if any other symptoms develop.
Note to Physicians: Ingestion of this product or subsequent vomiting may result in aspiration of light hydrocarbon liquid, which may cause pneumonitis.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Dry Chemical, CO2, Aqueous Film Forming Foam (AFFF) or alcohol resistant foam.
Unusual Fire Hazards: See Section 7 for proper handling and storage.
UNSUITABLE EXTINGUISHING MEDIA: No data available

PROTECTION OF FIRE FIGHTERS:
Fire Fighting Instructions: For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.
Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures:
Eliminate all sources of ignition in the vicinity of the spill or released vapor. If this material is released into the work area, evacuate the area immediately. Monitor area with combustible gas indicator.
Environmental Precautions:
Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater.
Methods and Material For Containment and Cleaning Up:
Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
Reporting:
Report spills to local authorities as appropriate or required.

SECTION 7 HANDLING AND STORAGE PRECAUTIONS

General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.
Precautionary Measures: This product presents an extreme fire hazard. Liquid very quickly evaporates, even at low temperatures, and forms vapor (fumes) which can catch fire and burn with explosive violence. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Never siphon gasoline by mouth.
Do not store in open or unlabeled containers. READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL. Use only as a motor fuel. Do not use for cleaning, pressure appliance fuel, or any other such use. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Do not breathe vapor or fumes. Wash thoroughly after handling. Keep out of the reach of children.
Static Hazard: Improper filling of portable gasoline containers creates danger of fire. Only dispense gasoline into approved and properly labeled gasoline containers. Always place portable containers on the ground. Be sure pump nozzle is in contact with the container while filling. Do not use a nozzle's lock-open device. Do not fill portable containers that are inside a vehicle or truck/trailer bed.

Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures.
Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty

container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

General Storage Information: DO NOT USE OR STORE near heat, sparks, flames, or hot surfaces . USE AND STORE ONLY IN WELL VENTILATED AREA. Keep container closed when not in use.

SECTION 8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

GENERAL CONSIDERATIONS:
Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities, and other substances in the workplace when designing engineering controls and selecting personal protective equipment (PPE). If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, refer to PPE information below.

Factors that affect PPE include, but are not limited to: properties of the chemical, other chemicals which may contact the same PPE, physical requirements (fit & sizing, cut/puncture protection, dexterity, thermal protection, etc.), and potential allergic reactions to the PPE material. It is the responsibility of the user to read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances. Refer to appropriate CEN standards.

ENGINEERING CONTROLS:
Use general ventilation, local exhaust ventilation, or a combination of both.

PERSONAL PROTECTIVE EQUIPMENT
Eye/Face Protection: Wear protective equipment to prevent eye contact. Selection of protective equipment may include safety glasses, chemical goggles, face shields, or a combination depending on the work operations conducted.
Skin Protection: Wear chemical personal protective equipment (PPE) to prevent skin contact. Selection of chemical protective clothing should be performed by an Occupational Hygienist or Safety Professional and be based upon applicable standards (ASTM F739 or EN 374). Using chemical PPE depends upon operations conducted and may include chemical gloves, boots, chemical apron, chemical suit, and complete facial protection. Refer to PPE manufacturers to obtain breakthrough time information to determine how long PPE can be used before it needs to be replaced. Unless specific glove manufacturer data indicates otherwise, the below table is based upon available industry data to assist in the glove selection process and is intended to be used as reference only.

Chemical Glove Material	Thickness (mm)	Typical Breakthrough Time (minutes)
Butyl	0.7	7
Neoprene	0.61	7
Nitrile	0.8	60
Nitrile	0.23	2
Polyvinyl Chloride (PVC)	1.1	2
Viton Butyl	0.3	120

Respiratory Protection: Determine if airborne concentrations are below the recommended occupational exposure limits for jurisdiction of use. If airborne concentrations are above the acceptable limits, wear an approved respirator that provides adequate protection from this material, such as: Air-Purifying Respirator for Organic Vapors. When used as a fuel, this material can produce carbon monoxide in the exhaust. Determine if airborne concentrations are below the occupational exposure limit for carbon

monoxide. If not, wear an approved positive-pressure air-supplying respirator.
Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

Component	Country/ Agency	Form	TWA	STEL	Ceiling	Notation
Gasoline	ACGIH	Vapor	300 ppm	500 ppm	--	A3
Gasoline	ACGIH	--	300 ppm	500 ppm	--	--
Toluene	ACGIH	--	20 ppm	--	--	--
Toluene	JSOH	--	188 mg/m3	--	--	Skin
Pentane, 2,2,4-trimethyl-	ACGIH	--	300 ppm	--	--	--
Pentane, 2,2,4-trimethyl-	JSOH	--	1400 mg/m3	--	--	--
Xylene	ACGIH	--	20 ppm	--	--	--
Xylene	JSOH	--	217 mg/m3	--	--	--
Trimethylbenzene (3 isomers: 1,2,3-; 1,2,4-; 1,3,5- isomer)	ACGIH	--	10 ppm	--	--	--
Butane	ACGIH	--	--	1000 ppm	--	--
Butane	JSOH	--	1200 mg/m3	--	--	--
Ethanol	ACGIH	--	1000 ppm	1000 ppm	--	A4
Hexane	ACGIH	--	50 ppm	--	--	Skin
Hexane	JSOH	--	140 mg/m3	--	--	Skin
Benzene	ACGIH	Vapor	0.50 ppm	2.50 ppm	--	--
Benzene	ACGIH	--	0.05 ppm	2.50 ppm	--	Skin
Benzene	CVX	Vapor	0.50 ppm	2.50 ppm	--	--
Heptane	ACGIH	--	400 ppm	500 ppm	--	--
Heptane	JSOH	--	820 mg/m3	--	--	--
Cyclohexane	ACGIH	--	100 ppm	--	--	--
Cyclohexane	JSOH	--	520 mg/m3	--	--	--
Ethylbenzene	ACGIH	Vapor	100 ppm	--	--	--
Ethylbenzene	ACGIH	--	20 ppm	--	--	--
Ethylbenzene	JSOH	--	87 mg/m3	--	--	Skin
Methylcyclohexane	ACGIH	--	400 ppm	--	--	--
Methylcyclohexane	JSOH	--	1600 mg/m3	--	--	--
Naphthalene	ACGIH	Vapor	10 ppm	15 ppm	--	A4 Skin
Naphthalene	ACGIH	--	10 ppm	--	--	Skin

Consult local authorities for appropriate values.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Colorless to yellow
Physical State: Liquid
Odor: Petroleum odor
Odor Threshold: No data available
pH: Not Applicable
Vapor Pressure: 5 psi - 15.50 psi (Typical) @ 37.8 °C (100 °F)
Relative Vapor Density: 3 - 4 (Typical)
Particle Characteristics: No data available
Boiling Point: 27.2°C (81°F) - 52.8°C (127°F) (Typical)

Solubility: Negligible
Freezing Point: Not Applicable
Melting Point: Not Applicable
Specific Gravity: 0.70 g/ml - 0.80 g/ml @ 15.6°C (60.1°F) (Typical)
Density: No data available
Viscosity: <1 SUS @ 37.8°C (100°F)
Evaporation Rate: No data available
n-Octanol/Water Partition Coefficient: 2 - 7
Combustion Characteristics (Solids/Gases): No data available
Decomposition Temperature: No data available
Boiling Range: No data available

FLAMMABLE PROPERTIES:
Flashpoint: (Tagliabue Closed Cup ASTM D56) < -45 °C (< -49 °F)

Autoignition: > 280 °C (> 536 °F)
Flammability (solid, gas): Not Applicable
Flammability (Explosive) Limits (% by volume in air): Lower: 1.4 Upper: 7.6

SECTION 10 STABILITY AND REACTIVITY

Reactivity: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Incompatibility With Other Materials: Not applicable
Hazardous Decomposition Products: None known (None expected)
Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 HAZARD INFORMATION

IMMEDIATE HEALTH EFFECTS
Eye: Contact with the eyes causes severe irritation. Symptoms may include pain, tearing, reddening, swelling and impaired vision.
Eye Irritation: This material causes serious eye irritation. The product has not been tested. The statement is based on evaluation of data for product components.

Skin: Contact with the skin causes irritation. Skin contact may cause drying or defatting of the skin. Symptoms may include pain, itching, discoloration, swelling, and blistering. Contact with the skin is not expected to cause an allergic skin response.
Acute Dermal Toxicity: LD50: >3.75 g/kg (rabbit).
Skin Irritation: For a 4-hour exposure, the Primary Irritation Index (PII) in rabbits is: 4.8/8.0.
Skin Sensitization: This material did not cause skin sensitization reactions in a Buehler guinea pig test.

Ingestion: Highly toxic; may be fatal if swallowed. Because of its low viscosity, this material can directly enter the lungs, if swallowed, or if subsequently vomited. Once in the lungs it is very difficult to remove and can cause severe injury or death. May be irritating to mouth, throat, and stomach. Symptoms may include pain, nausea, vomiting, and diarrhea.
Acute Oral Toxicity: LD50: >5 ml/kg (rat).

Inhalation: Excessive or prolonged breathing of this material may cause central nervous system effects. Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsions, loss of

consciousness, coma or death.
Acute Inhalation Toxicity: 4 hour(s) LD50: >20000 mg/m3 (rat).
Acute Toxicity Estimate: Not Determined

DELAYED OR OTHER HEALTH EFFECTS:
Reproductive Toxicity: Contains material that may cause harm to the unborn child if inhaled above the recommended exposure limit. This material is suspected of damaging the unborn child. The product has not been tested. The statement is based on evaluation of data for similar materials or product components.
Carcinogenicity: Prolonged or repeated exposure to this material may cause cancer. Gasoline has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Whole gasoline exhaust has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Contains benzene, which has been classified as a carcinogen by the National Toxicology Program (NTP) and a Group 1 carcinogen (carcinogenic to humans) by the International Agency for Research on Cancer (IARC).
Contains naphthalene, which has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC). Contains ethylbenzene which has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).
This material may cause cancer. The product has not been tested. The statement is based on evaluation of data for similar materials or product components.
Germ Cell Mutagenicity: This material may cause genetic defects. The product has not been tested. The statement is based on evaluation of data for similar materials or product components.

Target Organs: Contains material that may cause damage to the following organ(s) following repeated inhalation at concentrations above the recommended exposure limit: Blood/Blood Forming Organs
Specific Target Organ Toxicity - Single Exposure: This material may cause drowsiness or dizziness. The product has not been tested. The statement is based on evaluation of data for similar materials or product components.
Specific Target Organ Toxicity - Repeated Exposure: This material may cause damage to organs through prolonged or repeated exposure. The product has not been tested. The statement is based on evaluation of data for similar materials or product components.
Aspiration Hazard: This material is considered an aspiration hazard based on the kinematic viscosity of the material.

ADDITIONAL TOXICOLOGY INFORMATION:
This product contains naphthalene.
GENERAL TOXICITY: Exposure to naphthalene has been reported to cause methemoglobinemia and/or hemolytic anemia, especially in humans deficient in the enzyme glucose-6-phosphate dehydrogenase. Laboratory animals given repeated oral doses of naphthalene have developed cataracts.
REPRODUCTIVE TOXICITY AND BIRTH DEFECTS: Naphthalene did not cause birth defects when administered orally to rabbits, rats, and mice during pregnancy, but slightly reduced litter size in mice at dose levels that were lethal to the pregnant females. Naphthalene has been reported to cross the human placenta. GENETIC TOXICITY: Naphthalene caused chromosome aberrations and sister chromatid exchanges in Chinese hamster ovary cells, but was not a mutagen in several other in-vitro tests.CARCINOGENICITY: In a study conducted by the National Toxicology Program (NTP), mice exposed to 10 or 30 ppm of naphthalene by inhalation daily for two years had chronic inflammation of the nose and lungs and increased incidences of metaplasia in those tissues. The incidence of benign lung tumors (alveolar/bronchiolar adenomas) was significantly increased in the high-dose female group but not in the male groups. In another two-year inhalation study conducted by NTP, exposure of rats to 10, 30,

and 60 ppm naphthalene caused increases in the incidences of a variety of nonneoplastic lesions in the nose. Increases in nasal tumors were seen in both sexes, including olfactory neuroblastomas in females at 60 ppm and adenomas of the respiratory epithelium in males at all exposure levels. The relevance of these effects to humans has not been established. No carcinogenic effect was reported in a 2-year feeding study in rats receiving naphthalene at 41 mg/kg/day.

This product contains cyclohexane.
Cyclohexane primarily affects the central nervous systems of laboratory animals and humans. Acute or prolonged inhalation of cyclohexane at levels below the recommended exposure limits does not result in toxic effects while acute exposures to levels above these recommended limits can cause reversible central nervous system depression. Prolonged exposures of laboratory animals to high levels (up to low thousands of parts per million) have also caused reversible effects which included hyperactivity, diminished response to stimuli, and adaptive liver changes while very high levels (high thousands of parts per million) were fatal. No developmental effects were seen in rats or rabbits following exposures of up to 7000 ppm cyclohexane. No reproductive effects occurred in rats, although postnatal pup growth was reduced at 7000 ppm in a similar manner as observed in the parental animals. Cyclohexane has not been shown to be mutagenic in several in vitro and in vivo assays and has not produced tumors in several dermal application long-term bioassays. Based on these results and the lack of any mutagenic or genotoxic metabolites, cyclohexane is not expected to be mutagenic or genotoxic. Following dermal exposure, cyclohexane is rapidly absorbed, metabolized,and excreted.

This product contains butane.
An atmospheric concentration of 100,000 ppm (10%) butane is not noticeably irritating to the eyes, nose or respiratory tract, but will produce slight dizziness in a few minutes of exposure. No chronic systemic effect has been reported from occupational exposure.

This product contains benzene.
GENETIC TOXICITY/CANCER: Repeated or prolonged breathing of benzene vapor has been associated with the development of chromosomal damage in experimental animals and various blood diseases in humans ranging from aplastic anemia to leukemia (a form of cancer). All of these diseases can be fatal. In some individuals, benzene exposure can sensitize cardiac tissue to epinephrine which may precipitate fatal ventricular fibrillation.
REPRODUCTIVE/DEVELOPMENTAL TOXICITY: No birth defects have been shown to occur in pregnant laboratory animals exposed to doses not toxic to the mother. However, some evidence of fetal toxicity such as delayed physical development has been seen at such levels. The available information on the effects of benzene on human pregnancies is inadequate but it has been established that benzene can cross the human placenta.
OCCUPATIONAL: The OSHA Benzene Standard (29 CFR 1910.1028) contains detailed requirements for training, exposure monitoring, respiratory protection and medical surveillance triggered by the exposure level. Refer to the OSHA Standard before using this product.

This product contains n-hexane.
TARGET ORGAN TOXICITY: Prolonged or repeated ingestion, skin contact or breathing of vapors of n-hexane has been shown to cause peripheral neuropathy. Recovery ranges from no recovery to complete recovery depending upon the severity of the nerve damage. Exposure to 1000 ppm n-hexane for 18 hr/day for 61 days has been shown to cause testicular damage in rats. However, when rats were exposed to higher concentrations for shorter daily periods (10,000 ppm for 6 h/day, 5 days/wk for 13 weeks), no testicular lesions were seen.
CARCINOGENICITY: Chronic exposure to commercial hexane (52% n-hexane) at a concentration of 9000ppm was not carcinogenic to rats or to male mice, but did result in an increased incidence of liver tumors in female mice. No carcinogenic effects were observed in female mice exposed to 900 or 3000 ppm hexane or in male mice. The relevance for humans of these hexane-induced mouse liver tumors is questionable.
GENETIC TOXICITY: n-Hexane caused chromosome aberrations in bone marrow of rats, but was

negative in the AMES and mouse lymphoma tests.

This product contains ethanol (ethyl alcohol).
Chronic ingestion of ethanol can damage the liver, nervous system and heart. Chronic heavy consumption of alcoholic beverages has been associated with an increased risk of cancer. Ingestion of ethanol during pregnancy can cause human birth defects such as fetal alcohol syndrome.

Gasolines are highly volatile and can produce significant concentrations of vapor at ambient temperatures. Gasoline vapor is heavier than air and at high concentrations may accumulate in confined spaces to present both safety and health hazards. When vapor exposures are low, or short duration and infrequent, such as during refueling and tanker loading/unloading, neither total hydrocarbon nor components such as benzene are likely to result in any adverse health effects. In situations such as accidents or spills where exposure to gasoline vapor is potentially high, attention should be paid to potential toxic effects of specific components. Information about specific components in gasoline can be found in Sections 2/3, 8 and 15 of this MSDS. More detailed information on the health hazards of specific gasoline components can be obtained calling the Chevron Emergency Information Center (see Section 1 for phone numbers).

Pathological misuse of solvents and gasoline, involving repeated and prolonged exposure to high concentrations of vapor is a significant exposure on which there are many reports in the medical literature. As with other solvents, persistent abuse involving repeated and prolonged exposures to high concentrations of vapor has been reported to result in central nervous system damage and eventually, death. In a study in which ten human volunteers were exposed for 30 minutes to approximately 200, 500 or 1000 ppm concentrations of gasoline vapor, irritation of the eyes was the only significant effect observed, based on both subjective and objective assessments.

Lifetime inhalation of wholly vaporized unleaded gasoline at 2056 ppm has caused increased liver tumors in female mice and kidney cancer in male rats. In their 1988 review of carcinogenic risk from gasoline, The International Agency for Research on Cancer (IARC) noted that, because published epidemiology studies did not include any exposure data, only occupations where gasoline exposure may have occurred were reviewed. These included gasoline service station attendants and automobile mechanics. IARC also noted that there was no opportunity to separate effects of combustion products from those of gasoline itself. Although IARC allocated gasoline a final overall classification of Group 2B, i.e. possibly carcinogenic to humans, this was based on limited evidence in experimental animals plus supporting evidence including the presence in gasoline of benzene. The actual evidence for carcinogenicity in humans was considered inadequate.

MUTAGENICITY: Gasoline was not mutagenic, with or without activation, in the Ames assay (Salmonella typhimurium), Saccharamyces cerevisesae, or mouse lymphoma assays. In addition, point mutations were not induced in human lymphocytes. Gasoline was not mutagenic when tested in the mouse dominant lethal assay. Administration of gasoline to rats did not cause chomosomal aberrations in their bone marrow cells. EPIDEMIOLOGY: To explore the health effects of workers potentially exposed to gasoline vapors in the marketing and distribution sectors of the petroleum industry, the American Petroleum Institute sponsored a cohort mortality study (Publication 4555), a nested case-control study (Publication 4551), and an exposure assessment study (Publication 4552). Histories of exposure to gasoline were reconstructed for cohort of more than 18,000 employees from four companies for the time period between 1946 and 1985. The results of the cohort mortality study indicated that there was no increased mortality from either kidney cancer or leukemia among marketing and marine distribution employees who were exposed to gasoline in the petroleum industry, when compared to the general population. More importantly, based on internal comparisons, there was no association between mortality from kidney cancer or leukemia and various indices of gasoline exposure. In particular, neither duration of employment, duration of exposure, age at first exposure, year of first exposure, job category, cumulative exposure, frequency of peak exposure, nor average intensity of exposure had any effect on kidney cancer or leukemia mortality. The results of the nested case-control study confirmed the findings of the original cohort study. That is, exposure to gasoline at the levels experienced by this cohort of distribution workers is not a significant risk factor for leukemia (all cell types), acute myeloid leukemia, kidney cancer or multiple myeloma.

This product contains ethylbenzene.
BIRTH DEFECTS AND REPRODUCTION: Ethylbenzene is not expected to cause birth defects or other developmental effects based on well-conducted studies in rabbits and rats sponsored by NIOSH. Other studies in rats and mice which reported urinary tract malformations have many deficiencies and have limited usefulness in evaluating human risk. Reproductive effects are not expected based on a NIOSH study of fertility, and lack of effects observed for sperm counts and motility, estrous cycle and pathology of reproductive organs following repeated exposures. HEARING: Statistically significant losses in outer hair cells (OHCs) were observed in rats exposed to >=200 ppm ethylbenzene, 6 hours/day, 6 days/week for 13 weeks, after an 8-week recovery period. Following longer exposure, inner hair cells losses were also observed in rats exposed to >= 600 ppm ethylbenzene, but only occasionally in rats exposed to 400 ppm. The Lowest Observed Adverse Effect Level in rats (LOAEL) was 200 ppm for losses of OHCs. Guinea pigs exposed to ethylbenzene at 2,500 ppm, 6 hours/day for 5 days did not show auditory deficits or losses in OHCs. The concentration of ethylbenzene used in the JP-8 study was approximately 10 ppm. GENETIC TOXICITY: Ethylbenzene tested negative in the bacterial mutation test, Chinese Hamster Ovary (CHO) cell in vitro assay, sister chromatid exchange assay and an unscheduled DNA synthesis assay. Conflicting results have been reported for the mouse lymphoma cell assay. Increased micronuclei were reported in an in vitro Syrian hamster embryo cell assay; however, two in vivo micronuclei studies in mice were negative. In Syrian hamster embryo cells in vitro, cell transformation was observed at 7 days of incubation but not at 24 hours. Based on these results, ethylbenzene is not expected to be mutagenic or clastogenic. CARCINOGENICITY: In studies conducted by the National Toxicology Program, rats and mice were exposed to ethylbenzene at 25, 250 and 750 ppm for six hours per day, five days per week for 103 weeks. In rats exposed to 750 ppm, the incidence of kidney tubule hyperplasia and tumors was increased. Testicular tumors develop spontaneously in nearly all rats if allowed to complete their natural life span; in this study, the development of these tumors appeared to be enhanced in male rats exposed to 750 ppm. In mice, the incidences of lung tumors in males and liver tumors in females exposed to 750 ppm were increased as compared to control mice but were within the range of incidences observed historically in control mice. Other liver effects were observed in male mice exposed to 250 and 750 ppm. The incidences of hyperplasia were increased in the pituitary gland in female mice at 250 and 750 ppm and in the thyroid in male and female mice at 750 ppm.

This product contains toluene.
GENERAL TOXICITY: The primary effects of exposure to toluene in animals and humans are on the central nervous system. Solvent abusers, who typically inhale high concentrations (thousands of ppm) for brief periods of time, in addition to experiencing respiratory tract irritation, often suffer permanent central nervous system effects that include tremors, staggered gait, impaired speech, hearing and vision loss, and changes in brain tissue. Death in some solvent abusers has been attributed to cardiac arrhythmias, which appear to be have been triggered by epinephrine acting on solvent sensitized cardiac tissue. Although liver and kidney effects have been seen in some solvent abusers, results of animal testing with toluene do not support these as primary target organs.
HEARING: Humans who were occupationally exposed to concentrations of toluene as low as 100 ppm for long periods of time have experienced hearing deficits. Hearing loss, as demonstrated using behavioral and electrophysiological testing as well as by observation of structural damage to cochlear hair cells, occurred in experimental animals exposed to toluene. It also appears that toluene exposure and noise may interact to produce hearing deficits.
COLOR VISION: In a single study of workers exposed to toluene at levels under 50 ppm, small decreases in the ability to discriminate colors in the blue-yellow range have been reported for female workers. This effect, which should be investigated further, is very subtle and would not likely have been noticed by the people tested.
REPRODUCTIVE/DEVELOPMENTAL TOXICITY: Toluene may also cause mental and/or growth retardation in the children of female solvent abusers who directly inhale toluene (usually at thousands of ppm) when they are pregnant. Toluene caused growth retardation in rats and rabbits when administered at doses that were toxic to the mothers. In rats, concentrations of up to 5000 ppm did not cause birth defects. No effects were observed in the offspring at doses that did not intoxicate the pregnant animals. The exposure level at which no effects were seen (No Observed Effect Level, NOEL) is 750 ppm in the

rat and 500 ppm in the rabbit.

This product contains xylene.
ACUTE TOXICITY: The primary effects of exposure to xylene in animals and humans are on the central nervous system. In addition,in some individuals, xylene exposure can sensitize cardiac tissue to epinephrine which may precipitate fatal ventricular fibrillation. DEVELOPMENTAL TOXICITY: Xylene has been reported to cause developmental toxicity in rats and mice exposed by inhalation during pregnancy. The effects noted consisted of delayed development and minor skeletal variations. In addition, when pregnant mice were exposed by ingestion to a level that killed nearly one-third of the test group, lethality (resorptions) and malformations (primarily cleft palate) occurred. Since xylene can cross the placenta, it may be appropriate to prevent exposure during pregnancy. GENETIC TOXICITY/CARCINOGENICITY: Xylene was not genotoxic in several mutagenicity testing assays including the Ames test. In a cancer study sponsored by the National Toxicology Program (NTP),technical grade xylene gave no evidence of carcinogenicity in rats or mice dosed daily for two years. HEARING: Mixed xylenes have been shown to cause measurable hearing loss in rats exposed to 800 ppm in the air for 14 hours per day for six weeks. Exposure to 1450 ppm xylene for 8 hours caused hearing loss while exposure to 1700 ppm for 4 hours did not. Although no information is available for lower concentrations, other chemicals that cause hearing loss in rats at relatively high concentrations do not cause hearing loss in rats at low concentrations. Worker exposure to xylenes at the permissible exposure limit (100 ppm, time-weighted average) is not expected to cause hearing loss.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY
Gasoline studies have been conducted in the laboratory under a variety of test conditions with a range of fish and invertebrate species. An even more extensive database is available on the aquatic toxicity of individual aromatic constituents. The majority of published studies do not identify the type of gasoline evaluated, or even provide distinguishing characteristics such as aromatic content or presence of lead alkyls. As a result, comparison of results among studies using open and closed vessels, different ages and species of test animals and different gasoline types, is difficult.

The bulk of the available literature on gasoline relates to the environmental impact of monoaromatic (BTEX) and diaromatic (naphthalene, methylnaphthalenes) constituents. In general, non-oxygenated gasoline exhibits some short-term toxicity to freshwater and marine organisms, especially under closed vessel or flow-through exposure conditions in the laboratory. The components which are the most prominent in the water soluble fraction and cause aquatic toxicity, are also highly volatile and can be readily biodegraded by microorganisms.

This material is expected to be toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

48 hour(s) LC50: 3.0 mg/l (Daphnia magna)
96 hour(s) LC50: 1.8 mg/l (Mysidopsis bahia)
96 hour(s) LC50: 8.3 mg/l (Cyprinodon variegatus)
96 hour(s) LC50: 2.7 mg/l (Oncorhynchus mykiss)

MOBILITY IN SOIL
No data available.

PERSISTENCE AND DEGRADABILITY
This material is expected to be readily biodegradable. Following spillage, the more volatile components of gasoline will be rapidly lost, with concurrent dissolution of these and other constituents into the water. Factors such as local environmental conditions (temperature, wind, mixing or wave action, soil type, etc), photo-oxidation, biodegradation and adsorption onto suspended sediments, can contribute to the

weathering of spilled gasoline.

The aqueous solubility of non-oxygenated unleaded gasoline, based on analysis of benzene, toluene, ethylbenzene+xylenes and naphthalene, is reported to be 112 mg/l. Solubility data on individual gasoline constituents also available.

The product has not been tested. The statement has been derived from the properties of the individual components.

POTENTIAL TO BIOACCUMULATE
Bioconcentration Factor: No data available.
Octanol/Water Partition Coefficient: 2 - 7

ADVERSE EFFECTS FOR OZONE LAYER:
No data available.

SECTION 13 NOTES ON DISPOSAL

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by international, country, or local laws and regulations.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

UN Shipping Description: UN1203, GASOLINE, 3, II

IMO/IMDG Shipping Description: UN1203, GASOLINE, 3, II, FLASH POINT SEE SECTION 9, MARINE POLLUTANT (GASOLINE)

ICAO/IATA Shipping Description: UN1203, GASOLINE, 3, II

Domestic Regulatory Information
Land Regulatory Information: subject to the provisions of the Fire Service Act
Maritime Regulatory Information: subject to the provisions of the Ship Safety Act
Aviation Regulatory Information: subject to the provisions of the Civil Aeronautics Act

SECTION 15 REGULATORY INFORMATION

REGULATORY LISTS SEARCHED:
01-1=IARC Group 1
01-2A=IARC Group 2A
01-2B=IARC Group 2B
02-1=PRTR (Pollutant Release and Transfer Register) Class 1
02-2=PRTR (Pollutant Release and Transfer Register) Class 2
03-1=Industrial Safety and Health Law (Harmful Substances, etc., Prohibited for Manufacture)
03-2=Industrial Safety and Health Law (Harmful Substances Subject to Obtaining Permission for Manufacturing)
03-3=Industrial Safety and Health Law (Harmful Substances Whose Names, etc., are to Be Indicated)
03-4=Industrial Safety and Health Law (Notifiable Substances)
04-1=Poisonous and Deleterious Substances Control Law (Poisonous substance)
04-2=Poisonous and Deleterious Substances Control Law (Deleterious substance)

The following components of this material are found on the regulatory lists indicated.

Gasoline	01-2B
Toluene	02-1, 03-3, 03-4, 04-2
Pentane, 2,2,4-trimethyl-	02-2, 03-3
Xylene	02-1, 03-3, 03-4, 04-2
Trimethylbenzene (3 isomers: 1,2,3-; 1,2,4-; 1,3,5-isomer)	02-1, 03-3, 03-4
Butane	03-3, 03-4
Ethanol	01-1, 03-3, 03-4
Hexane	02-1, 03-3, 03-4
Benzene	01-1, 02-1, 03-1, 03-3, 03-4
Heptane	02-1, 03-3, 03-4
Cyclohexane	02-1, 03-3, 03-4
Ethylbenzene	01-2B, 02-1, 03-3, 03-4
Methylcyclohexane	03-3, 03-4
Naphthalene	01-1, 01-2B, 02-1, 03-3, 03-4

JAPANESE FIRE LAW: Group 4, Class 1 Petroleum

CHEMICAL INVENTORIES:
All components comply with the following chemical inventory requirements: AIIC (Australia), DSL (Canada), EINECS (European Union), KECI (Korea), NZIoC (New Zealand), PICCS (Philippines), TCSI (Taiwan).

SECTION 16 OTHER INFORMATION

REVISION STATEMENT: SECTION 08 - Engineering Control Measures information was modified.
SECTION 08 - General Considerations information was modified.
SECTION 08 - Occupational Exposure Limit Table information was modified.
SECTION 08 - Personal Protective Equipment List information was deleted.
SECTION 08 - Personal Protective Equipment information was added.
SECTION 08 - Skin Protection information was modified.
SECTION 15 - Regulatory Information information was modified.

Revision Date: 2023/03/01

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Governmental Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	SDS - Safety Data Sheet
CVX - Chevron	NFPA - National Fire Protection Association (USA)
	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	

Prepared according to JIS Z 7253:2019 / JIS Z 7252:2019 by Chevron Technical Center, 6001 Bollinger Canyon Road, San Ramon, CA 94583.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is

furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

Universal Industrial Gases, Inc.

SAFETY DATA SHEET

Material Name: Nitrogen, Compressed Gas **SDS ID: UIG-N2-G01-R0**

Section 1 – Product and Company Identification	
Product Identifier:	Nitrogen
Other means of identification:	Nitrogen Gas, N2, GAN (Gaseous Nitrogen), Di-atomic nitrogen, Compressed Nitrogen, Food Grade Nitrogen, Nitrogen NF
Product Uses:	Industrial manufacturing including inerting, medical, metals processing, foods, etc.
Supplier Details:	Universal Industrial Gases, Inc 3001 Emrick Blvd, Suite 320 Bethlehem, PA 18020 USA
Emergency Phone Number:	(610) 559-7967

Section 2 – Hazards Identification	
Classification in accordance with paragraph (d) of §1910.1200	Gas Under Pressure – Compressed gas Simple asphyxiant
Signal word Hazard statement(s) Symbol Precautionary statement	Warning Gas in pipelines may be under pressure, cylinders may explode if heated May displace oxygen and cause rapid suffocation  Read completely and follow all Safety Data Sheets before use Colorless, odorless gas Never enter an area where nitrogen may have caused an oxygen deficiency Ensure proper ventilation Use equipment and materials rated for service Protect cylinders from sunlight, store in ventilated area Rapid release of compressed gas may cause frostbite if contacted
Hazards not otherwise classified	None
Toxicity	Non-toxic but may displace oxygen which can cause dizziness, unconsciousness and death by asphyxiation.

Section 3 – Compositions / Information of Ingredients	
Chemical Name & Formula	Nitrogen, N2
Common Name and Synonyms	Nitrogen Gas, N2, GAN (Gaseous Nitrogen), Di-atomic nitrogen, Compressed Nitrogen, Food Grade Nitrogen, Nitrogen NF
CAS Number	7727-37-9, Nitrogen Compressed
Purity	Nominally 100%, typically provided >99%, by volume. NOTE: Some on-site nitrogen generated gas can be as low as 95%, with balance being primarily oxygen.

Section 4 – First Aid Measures	
Inhalation	Simple asphyxiant, may cause acute effects including dizziness, drowsiness, nausea, rapid breathing, unconsciousness, and death. Immediately remove victim to fresh air containing sufficient oxygen. If not breathing provide artificial respiration or oxygen by trained personnel, get immediate medical attention. Rescuers must not enter an oxygen deficient area without self contained breathing apparatus.
Skin Contact	No adverse effects expected from gas at normal temperature. Very cold gas may cause frostbite.
Eye Contact	No adverse effects normally expected from gas. Avoid high pressure or very cold gas. Remove contact lenses. Flush with water, seek medical attention if irritation persists.
Ingestion	Not an expected route of exposure, refer to inhalation section above.
Most important symptoms, effects, acute and delayed	Refer to asphyxiation acute effects as per inhalation above
Immediate medical attention and special treatment needed	If symptoms occur, seek medical advice and attention.

Section 5 – Fire Fighting Measures	
Suitable extinguishing media	Nitrogen is not flammable, will not burn. Use appropriate extinguishing media for surrounding fire.
Special hazards arising (e.g. nature of any hazardous combustion process)	If product under pressure in closed contained, heat from fire may cause pressure to rise and container to burst. Cool any containers with water if possible. Under certain high temperature conditions, nitrogen may react violently to form nitrides with certain metals such as lithium, titanium, magnesium.
Special protective equipment and precautions for firefighters	Wear appropriate protective gear and self-contained breathing apparatus. Never attempt to rescue a suspected asphyxiation victim without proper precautions, training and equipment to also avoid exposure to oxygen deficient conditions.

Section 6 – Accidental Release Measures	
Personal precautions, protective equipment, emergency procedures	First responders should ensure oxygen concentration in area is safe (>19.5%) or be trained and use self-contained breathing apparatus before attempting to rescue a victim. Evacuate personnel to safe area, do not allow personnel to walk or drive in area that is potentially oxygen deficient. Use oxygen monitors to ensure adequate oxygen levels. Never enter suspected oxygen deficient area without being properly trained and wearing a self-contained breathing apparatus.
Methods and materials for containment and clean up	Isolate any leaking sources of nitrogen if it can be done safely. Ventilate the area if possible.

Section 7 – Handling and Storage	
Precautions for safe handling	Protect system components against physical damage. Use adequate ventilation. Avoid inhalation and potential confined space areas, use oxygen monitors where appropriate. Never work on a pressurized system. Wear gloves when moving cylinders. Safety glasses always recommended when working with compressed gases. Refer to CGA Safety Bulletin SB-2 “Oxygen Deficient Atmospheres” for additional recommendations.
Conditions for safe storage, including any incompatibilities	Use storage containers, piping, valves and fittings designed for storage and distribution of Gaseous Nitrogen. Protect cylinders against physical damage. Store in cool, dry, well-ventilated, fireproof area, away from flammable materials and corrosive atmospheres. Store away from heat and ignition sources and out of direct sunlight. Do not store near elevators, corridors or loading docks. Do not allow area where cylinders are stored to exceed 52°C (125°F). Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap in-place (where provided) until cylinder is placed into service and after it is taken out of service. Use designated CGA fittings and other support equipment. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

Section 8 – Exposure Controls / Personal Protection	
Permissible exposure limits	There are no exposure limits for this product. Oxygen levels should be kept above 19.5% for all personnel.
Appropriate Engineering Controls	Adequate ventilation. Low Oxygen monitors and alarms in areas where oxygen deficiency is possible. Pressurized systems to have relief valves properly sized, calibrated and vented.
Individual protection measures / personal protective equipment	Use self-contained breathing apparatus for entering any suspected oxygen deficient area. Personnel oxygen monitors. Gloves and safety shoes for handling containers/cylinders. Safety glasses / face protection if exposure to discharged gases, eye wash station. Check systems regularly for leaks.

Section 9 – Physical and Chemical Properties			
Property	**Value**	**Property**	**Value**
Appearance	Colorless	Upper/Lower Explosive Limit	NA
Odor	Odorless	Vapor Pressure	NA
Odor Threshold	NA	Vapor Density	0.0725 lb/ft3 @ 70°F 1.16 kg/m3 @ 21.1°C
Molecular Weight	28.01 g/mol	Specific Volume	13.80 ft3/lb @ 70°F 0.861 m3/kg @ 21.1 °C
pH	NA	Relative Density to Air (=1)	0.97
Melting / Freezing Point	-346°F / -210°C	Solubility	Slight in water
Boiling Point	-321°F / -196°C	Partition Coefficient: n-octanol / water	NA
Flash Point	NA	Auto Ignition Temperature	NA
Evaporation Rate	NA	Decomposition Temperature	NA
Flammability	Non-flammable	Viscosity (dynamic)	0.0175 centipoise @70°F

Section 10 – Stability and Reactivity	
Reactivity	Not reactive under normal conditions
Chemical Stability	Stable at normal temperatures and pressures
Possibility of Hazardous Reactions	None typically but will react with metals such as lithium, titanium, and magnesium at high temperatures.
Conditions to Avoid	Exposure to certain reactive metals at high temperatures High concentrations causing oxygen deficiency atmosphere leading to asphyxiation effects (see sections 4, 6, 7 & 8)
Incompatible Materials	None known
Hazardous Decomposition Products	None

Section 11 Toxicology Information	
Information on likely routes of exposure	No chemical toxicity Inhalation – simple asphyxiant Ingestion – not an expected route Skin – no affects expected normally, cold gas may cause frostbite Eye – no effects expected normally, cold gas may cause frostbite
Symptoms related to physical, chemical, toxicological characteristics	As a simple asphyxiant, the presence of high concentrations causing an oxygen deficiency in air has symptoms which include dizziness, drowsiness, nausea, unconsciousness, and death.
Delayed, Immediate, chronic effects from short and long term exposure	As a simple asphyxiant, the immediate effects of high concentrations causing oxygen deficiency in air include dizziness, drowsiness, nausea, unconsciousness, and death.
Numerical measures of toxicity	LD50 – not available LC50 – not available
Carcinogen Listing	Not carcinogenic

Section 12 – Ecological Information	
Ecotoxicity	None
Persistence and degradability	Not applicable. Normal air is approximately 78% nitrogen by volume.
Bio-accumulative potential	No information available
Mobility in Soil	No information available
Other Adverse effects	No known other effects

Section 13 – Disposal Considerations	
Waste residues and disposal guidelines	Product will normally dissipate in air. Dispose of any contents or containers in accordance with applicable regulations. Cylinders should be returned in original shipping container/method with any valves closed and protective plugs or caps securely in place.

Section 14 – Transport Information	
US DOT UN ID Number	UN1066
UN Proper Shipping Name	Nitrogen, compressed
DOT Transportation Hazard Class	DOT Class 2.2 (Non-Flammable compressed gas) Emergency Response Guide No. 121 
Packing Group	Not Applicable
Environmental Hazards	None
Transport Bulk Codes	Not Applicable
Special Precautions	Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Isolate area to avoid personnel exposure or other vehicles entering the area. High pressure gas cylinders should have outlet valves closed, with plugs/valve caps secured in place. Load space must be separated from driver compartment. Cylinders should be firmly secured from moving or falling during transport.

Section 15 - Regulatory Information
US Federal TSCA 8(a) CDR - exempted
US EPA SARA Title III Section 312 hazard Category: Sudden release of pressure hazard
US States Right-To-Know Lists: Massachusetts, New Jersey, Pennsylvania

SAFETY DATA SHEET

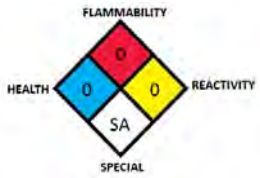
Material Name: Nitrogen, Compressed Gas **SDS ID: UIG-N2-G01-R0**

Section 16 – Other Information

US Nation Fire Protection Agency (NFPA) hazard ratings:

(Scale of 0 to 4, with 0 = lowest increasing to 4 = highest hazard, refer to NFPA for details related to the relative rating for each category)

Health: 0
Fire: 0
Reactivity: 0
Special: SA (Simple Asphyxiant)



US Hazardous Material Information System (HMIS) ratings:

(Scale: 0 = minimal, 1 = slight, 2= moderate, 3 = serious, 4 = severe)

HEALTH	0
FLAMMABILITY	0
PHYSICAL HAZARDS	3

New SDS: 29 June 2018 Rev 0

USE OF THIS INFORMATION:

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1) Disseminate this information internally to all workplace areas, employees, agents and contractors likely to encounter this product
2) Provide supplemental hazards awareness, safety information, operation and maintenance procedures to the workplace areas and employees, agents and contractors likely to encounter this product
3) Furnish this information to all their customers who purchase this product
4) Ask each purchaser or user of the product to notify its employees and customers of the product hazards and safety information.

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